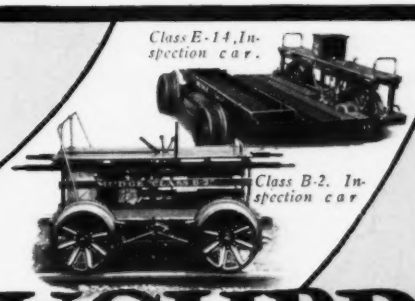
Railway Engineering and Maintenance

Mudge Motor Cars— THOROUGHBREDS of the rails

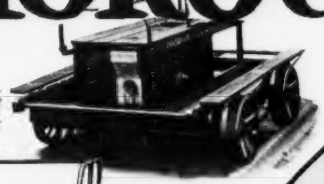
Always reliable

Usually the favorites

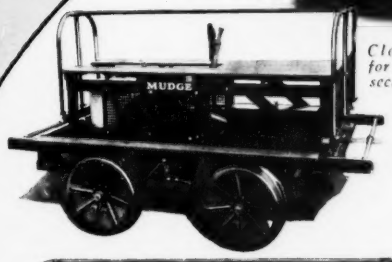


Class E-14, Inspection car.

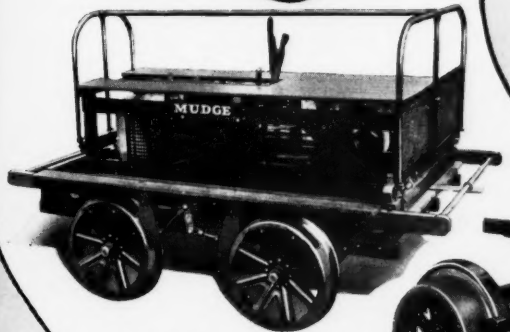
Class B-2. Inspection car



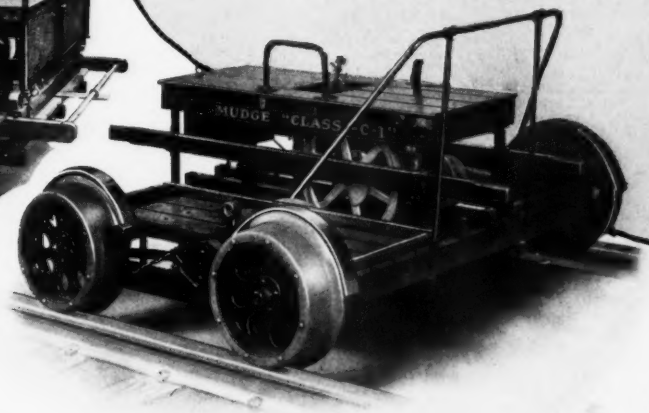
Class A-1. For light section work.



Class WS-2, for standard section work.



Class WS-3, a powerful car for heavy duty.



Class C-1, latest Mudge thoroughbred. A one-man car with air-cooled engine. Weighs less than 400 lbs. Has all the sturdiness of the larger models.

Mudge & Company

Manufacturers—Railroad Equipment

RAILWAY ENGINEERING AND MAINTENANCE
Published monthly by Simmons-Boardman Publishing Co., at 608 S. Dearborn St., Chicago. Subscription price: United States, Canada and Mexico, $2.00; foreign countries, $3.00 a year. Single copy, 35 cents. Entered at Chicago, Ill., as second-class matter.

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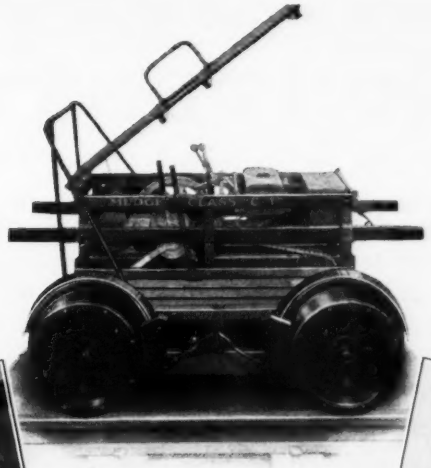

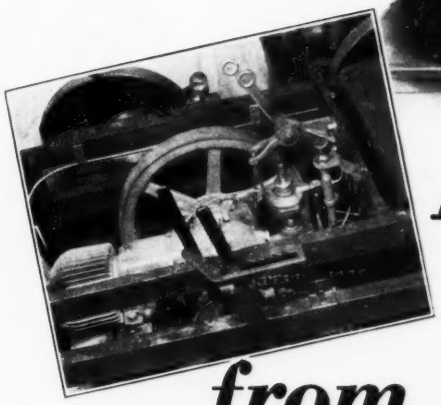

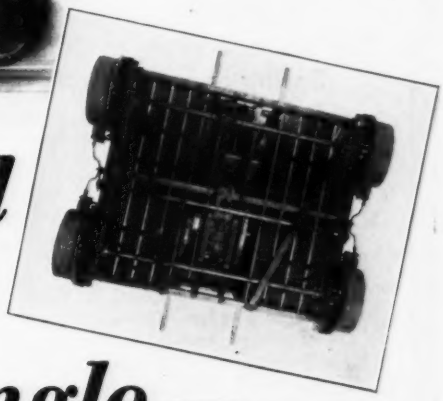

Looked at from any angle— the Mudge C-1 "Centerlight" *is a good car*

Consider the light weight (under 400 lbs.), the advanced design of its air-cooled engine, the sturdy frame, the improved brakes, the Alemite lubrication, etc.—from the standpoint of any of its parts, the Mudge C-1 is good.

Consider performance, ease in handling, life, maintenance cost, power, dependability, riding quality, etc.—from any of these service standpoints, the Mudge C-1 is good.

It meets the long felt need for a one-man car of *sturdy* construction, weighing less than 400 lbs. and with ample power for grades and head winds. You will appreciate it most after you have used it.

Mudge & Company

Manufacturers—Railroad Equipment
Railway Exchange Bldg. • CHICAGO

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Volume 23 June, 1927 Number 6

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Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

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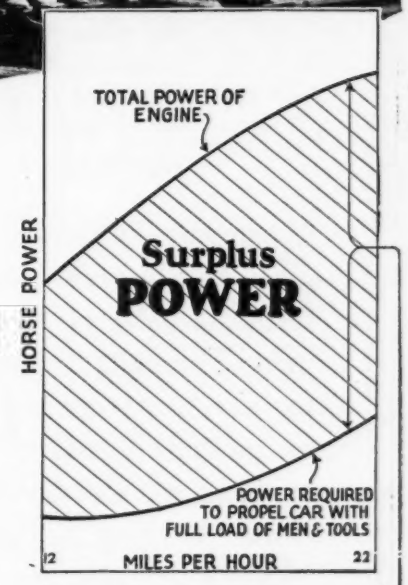
Railway Engineering and Maintenance is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulation (A. B. C.)

Fairmont POWER

Always In Reserve

Emergencies are the test of railway motor cars. Wrecks, wash-outs, or jobs calling for rush handling of heavy materials like rails, switch points, and the handling of men and tools, comprise these "unforeseen" conditions which occur on every railroad and which should be thoroughly considered in the purchase of railway motor cars. Large reserve drawbar horse power is invaluable in emergencies.

FAIRMONT cars are universally adopted because of their universal and more economical adaptability for both routine and emergency work.



The Drawbar Horse Power or SURPLUS POWER of a motor car at any given speed is the power exerted at the drawbar over and above what is required to propel the car when loaded with its normal rated load.

FAIRMONT RAILWAY MOTORS, Inc.
FAIRMONT, MINNESOTA

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Gang and Power Cars AT2—MT2—ST2
Roller Axle Bearings Ringsealed—Axisaver —Hyatt
Wood Burners C(M27)—B(M27)
Improved Wheels and Axles
Power Track Cranes **Safety Appliances**

ELECTRIC TAMPERS

FOR EXTENSIVE SURFACING OPERATIONS

By utilizing two Jackson Type L-2 8-Tamper Units, roads handling their surfacing with extra gangs can increase their track feet surfaced per day per man by 2 1-2 to 3 1-2 times over gangs using ordinary methods.

Maximum results and lowest cost are obtainable by organizing a machine surfacing gang of from 30 to 35 men. This gang is sufficiently large to raise track, operate 8 Tampers on tie ends outside of rail following jacks and spot board and 8 machines bringing up the rear for tamping ties inside the rail.

On one of the leading Western roads two 8-Tamper units under one foreman with this type of organization are surfacing on the main line from 1800 to 2100 track feet per day, rock ballast.

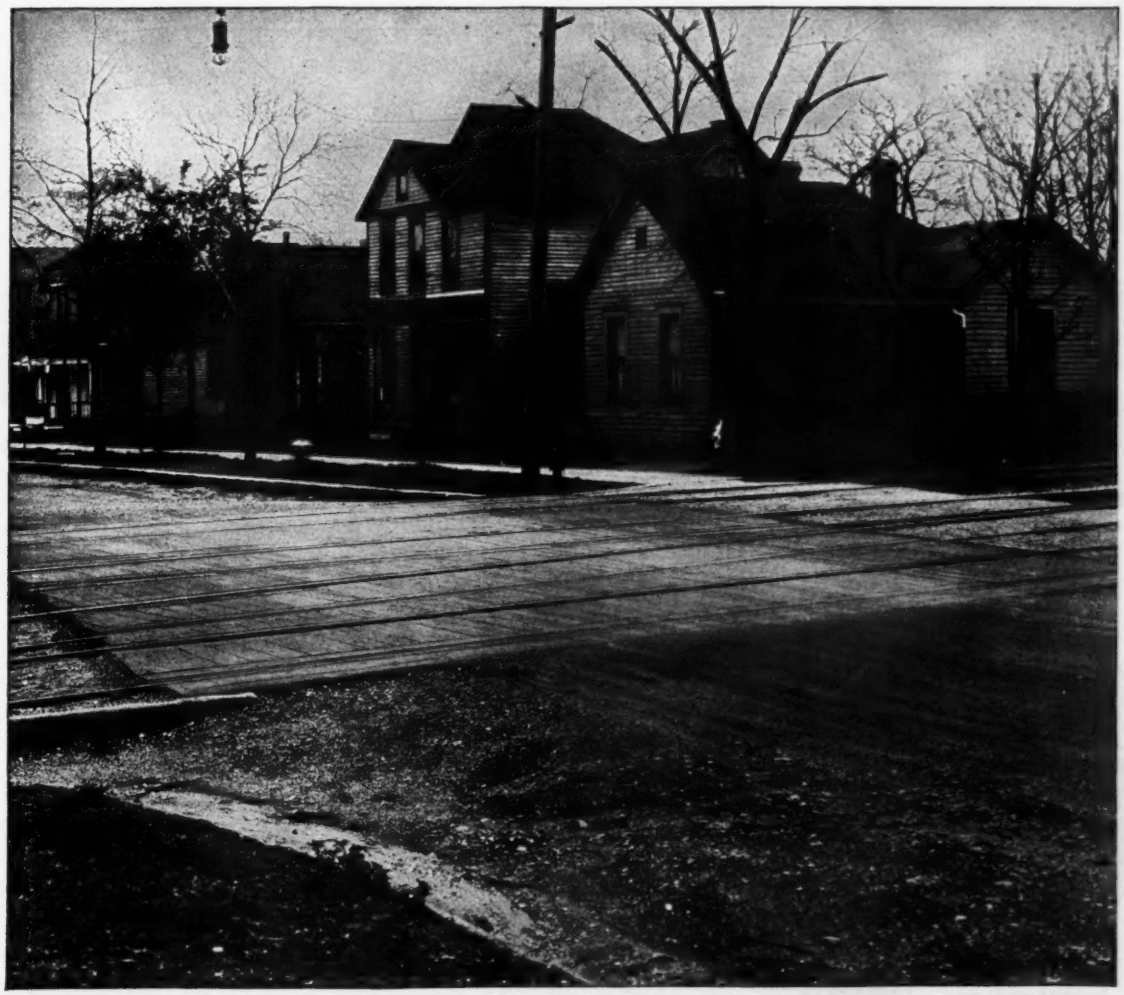
The cost of machine surfacing averages 2 1-2c per track foot whereas hand surfacing is averaging 15c per track foot.

Are your extra gangs of this size making such a record and keeping down the cost?

ELECTRIC TAMPER & EQUIPMENT CO.

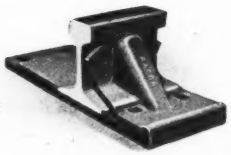
RAILWAY EXCHANGE CHICAGO, ILLINOIS

with the track!



Pennsylvania R. R. Crossing, Terre Haute, Indiana, protected indefinitely against weather and traffic by Carey Elastite Preformed Track Pavement.

HOW GOOD IS "GOOD ENOUGH"
—*IN SPLIT SWITCH FIXTURES?*

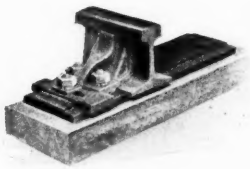


RACOR
Drop Forged Copper-Steel Rail Brace

These braces are of the plain type with a high rib for ordinary use or with a low rib to clear detector bars. After being sheared to length they are ground to a close fit with the rail section or switch slide plate with which they are to be used. The drop forged copper-steel of these braces is highly resistant to brine drippings and other corrosive influence.

TAKE rail braces for instance. They are essential on switches to buttress the stock rails against the side thrusts of traffic tending to widen the gage and overturn them—a very important undertaking. Is any rail brace good enough for this work? Or should it have strength, toughness, rust resistance and stand-up qualities — RACOR qualities — to withstand the terriffic strain on the stock rail.

Nothing but the best is Good Enough in track.



RACOR
Adjustable Rail Brace of malleable iron or steel-copper

This brace assures a tight fit of switch point rail against stock rail, with an adjustment that will stay put, because it is possible to adjust the alignment of switch stock rail accurately at time of installation. It can be furnished for installation to replace the heavy rigid braces used largely in interlocked switch layouts without moving the slide plates or without disturbance of the track.

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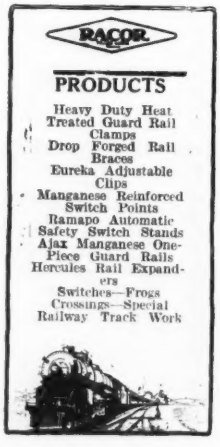
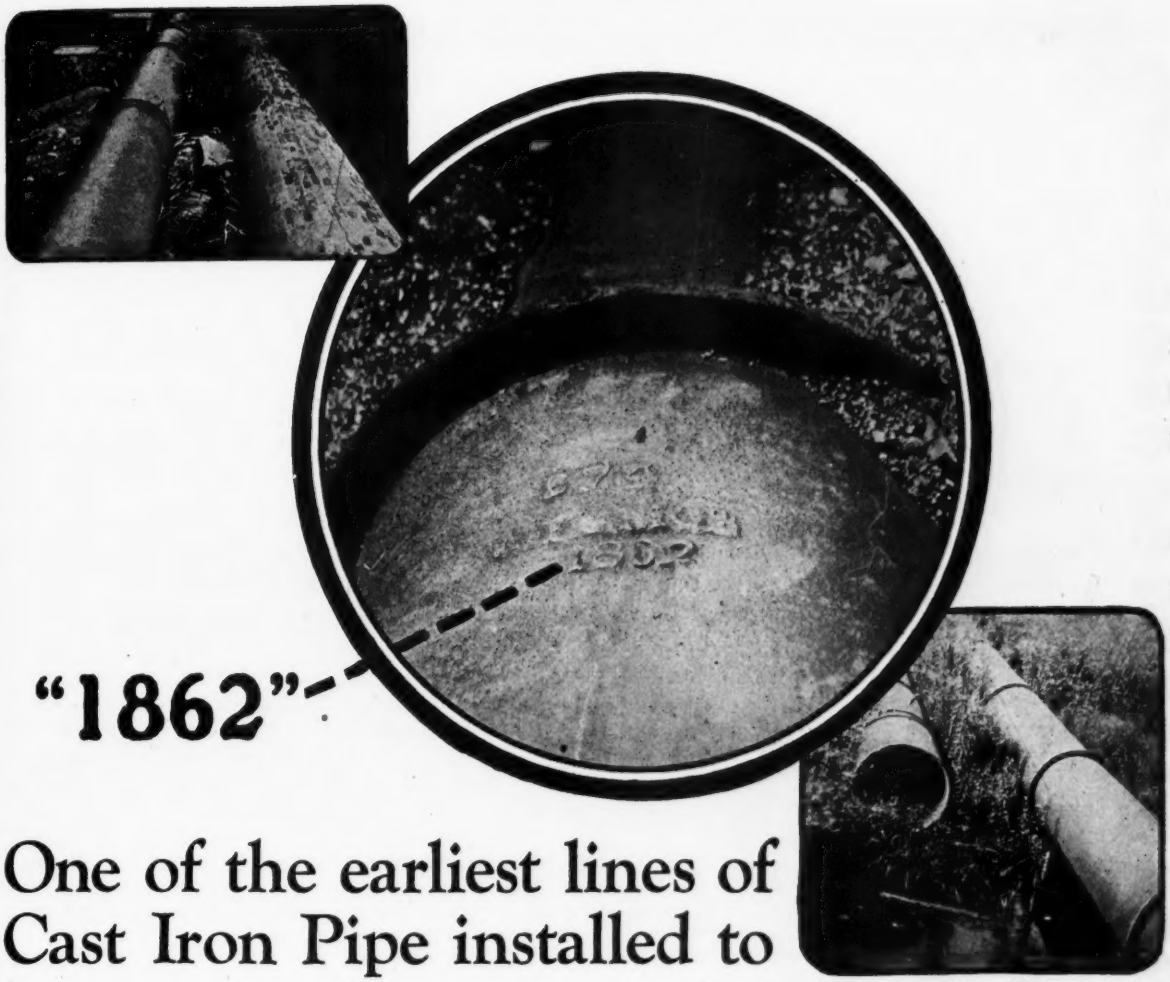


RAMAPO AJAX CORPORATION



One of the earliest lines of Cast Iron Pipe installed to insure continuous service

This line runs across salt marshes. It demonstrates the high resistance of Cast Iron Pipe to corrosion.

After sixty-five years under these conditions, the line shows not the slightest sign of weakness anywhere.

Write for U. S. Cast Iron Pipe handbook. It contains necessary data for construction engineers.

United States Cast Iron Pipe and Foundry Company

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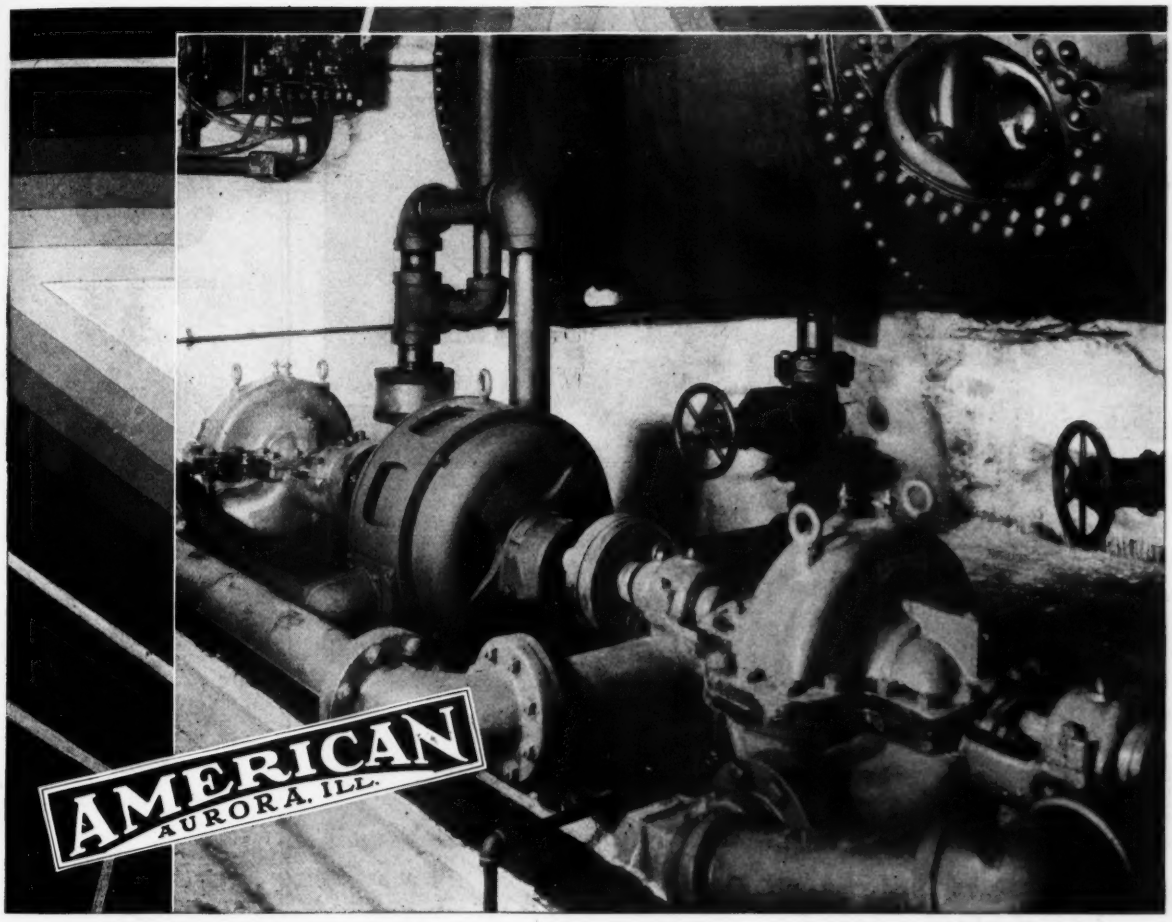

"AMERICAN" Pumps for Hydraulic Elevator Service

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"AMERICAN" centrifugal pumps are standard equipment for many industrial uses. The installation above was made in the Philadelphia and Reading R. R. Company's freight house in Philadelphia. The two pumps, mounted on one base with a motor between, operate in series, the unit being used to activate a hydraulic elevator.

The unit is designed to have a capacity of 225 G. P. M. when operating against a total working-pressure of 200 lbs. per square inch, at 1750 R. P. M.

The motor used is one of 50-H. P.

THE AMERICAN WELL WORKS

General Offices AURORA, ILLINOIS *and Factory*

Making quick work of ashes

A wet ash pit is a tough place to work in—but a Hayward Bucket is not looking for a white collar job. It pitches in and gets the work done in quick time.

Watch the powerful jaws of a Hayward crunching their way through the ashes, coming up with an overcapacity load time after time. Note the even stream of the discharge and the accuracy of control which a Hayward makes possible.

Cleaning ash pits is only one of many railroad jobs which Haywards successfully tackle, such as coaling locomotives, ditch digging, loading and unloading road ballast, rehandling stored materials. Let Hayward engineers help you to select the type of bucket best fitted to the job.

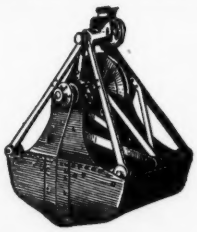
THE HAYWARD COMPANY

46 Dey Street New York, N. Y.

Builders of Clam Shell, Drag Line, Orange Peel and Electric Motor Buckets; Dredging, Excavating, and Coal Handling Machinery, Automatic Take-Up Reels; Counterweight Drums.

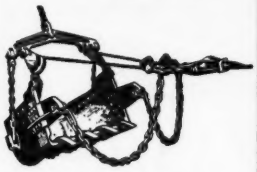
Hayward Buckets

Electric Motor Buckets

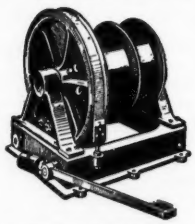


Clam Shell Buckets

Orange Peel Buckets



Drag Scraper Buckets



Counterweight Drums

Automatic Take-Up Reels

Skid Excavators and Dredges

Dependable
Mechanical Painting Equipment

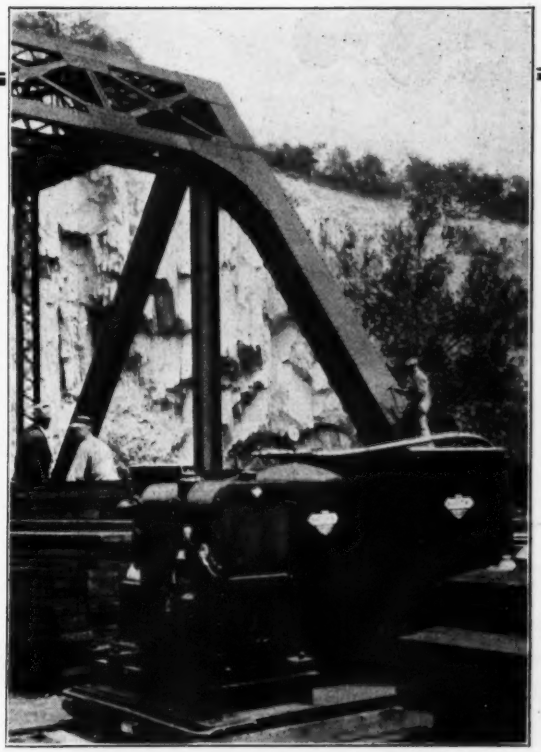


Illustration at right shows a Figure 105 Matthews Mechanical Painting Equipment being used for painting a railroad bridge.

No longer is it a question of whether Mechanical Equipment will effect a definite, worth while saving in the cost of railroad maintenance painting. Experience has proven conclusively its economy. Now it is only a question of the dependability of the equipment itself.

The fact that an increasing number of railroads are installing Matthews Mechanical Painting Equipment and adding to what they already have in service, certainly indicates the ability of the Matthews Equipment to stand up under this service and perform satisfactorily.

Take the case of the Baltimore Division of the B. & O. After testing a number of makes, this railroad standardized on the Matthews Figure 105 illustrated below and equipped each of their thirteen division points with Matthews Equipment.

Let us show you how a Figure 105 Matthews Mechanical Painting Equipment is especially adapted to your maintenance painting work.

Fig. 105. Complete two-unit with heavy duty equipment. Air capacity sufficient to operate three units or one rotary wire brush.

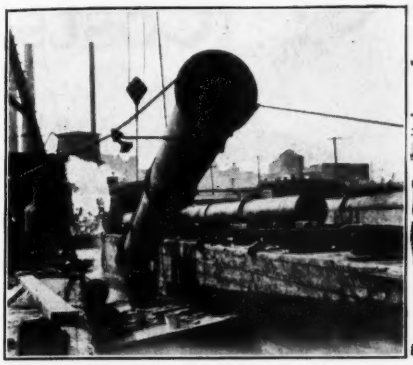
Get This Booklet

"Mechanical Painting For Maintenance" is a 12-page booklet that will answer many of the questions you will want to ask about your painting problems. Tells about mechanical painting in general. Gives comparative costs on brick, corrugated iron, stucco, weatherboard, shingle roofs, tanks and all kinds of materials handled and how to select them. Shows photographs of different equipments and close ups of various units in their make up. Gives extracts from 14 letters received from prominent manufacturers regarding their experiences. Has a page of questions and answers. Tells about instruction to your men and service you can expect. Send for this booklet today.

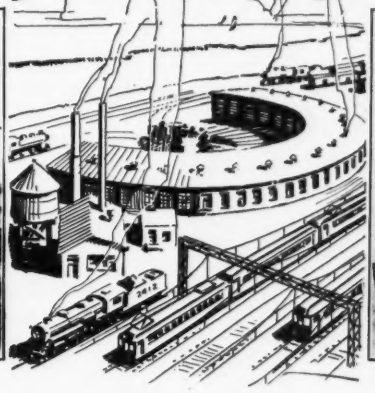
W. N. MATTHEWS CORPORATION
3770 Forest Park Blvd. St. Louis, U. S. A.

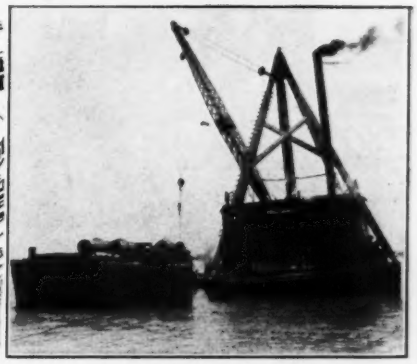
MATTHEWS
MECHANICAL PAINTING
EQUIPMENT

As Deep Water Gives Way to Deeper Earth



48-foot section being laid





The pipe-laying equipment

A NEW line to deep water in Lake Michigan, that presents many unusual elements of interest to the waterworks engineer, has recently been completed by the Illinois Central Railroad to supply their 27th Street Shops at Chicago.

This line extends from the intake well at the old shoreline to the new breakwater, a distance of 650 feet.

The section of the lake traversed will be filled in to become a part of Chicago's Park System.

The fact that this line would be covered by about 25 feet of earth, and would consequently be likely to settle—plus the additional fact that parts of it would be subjected to wave action in the meantime, presented some interesting problems—all of which were solved by the use of Cast Iron Pipe.

The line is built of standard Bell and Spigot Cast Iron Pipe with every fourth section carrying a flexible ball joint permitting 10 degrees of deflection every 48 feet.

The pipe was assembled in 48-foot sections of four joints. All joints were made above water except those to the intake well and to the strainer at the outer end, which were made by a diver.

Showing the use of the flexible ball joint

The line was built by the Great Lakes Dredge and Dock Company, following plans developed by Mr. C. R. Knowles, Supt. of Water Service for the Illinois Central and Chairman Water Service Committee American Railway Engineering Association.

Speaking of the use of Cast Iron Pipe, Mr. Knowles said: "Because of the unusual character of this line, we gave very careful consideration to the pipe line material before deciding on Cast Iron Pipe. Cast Iron Pipe has proven to be the most satisfactory for underground water service for practically all conditions and its use is recommended for all installations where permanency and durability are desired."

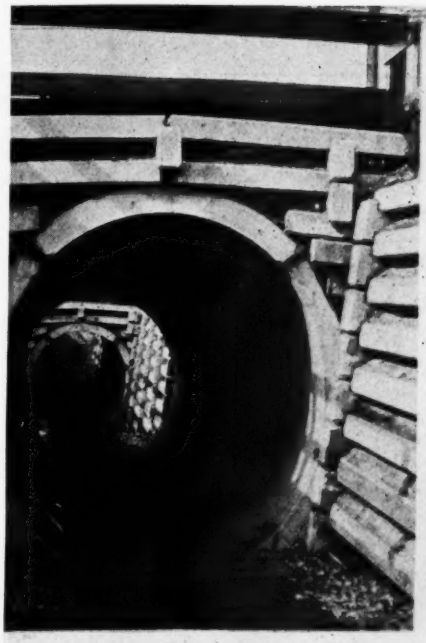
This Bureau will gladly co-operate in any phase of water supply and pipe line construction. No obligation.

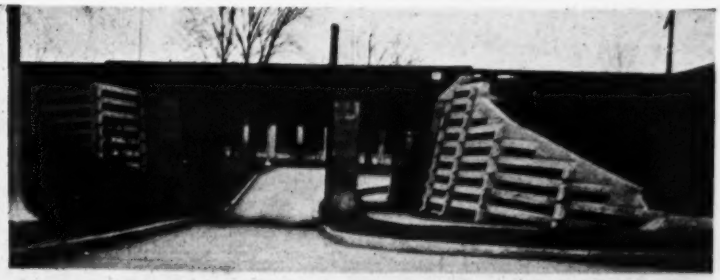
Address: RESEARCH ENGINEER
THE CAST IRON PIPE PUBLICITY BUREAU, PEOPLES GAS BUILDING, CHICAGO

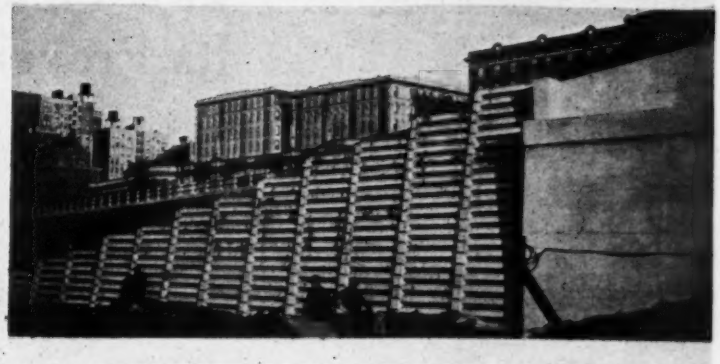
Wing Walls

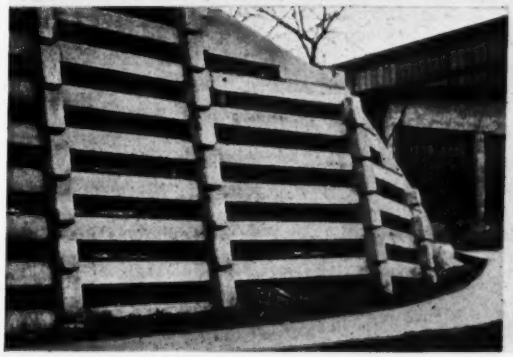
AMONG the many applications of Massey Concrete Cribbing, it will be found that money, time, and trouble can usually be saved by the use of such construction for wing walls. The illustrations below show typical cases in which these advantages led to the use of cribbing in place of monolithic construction.

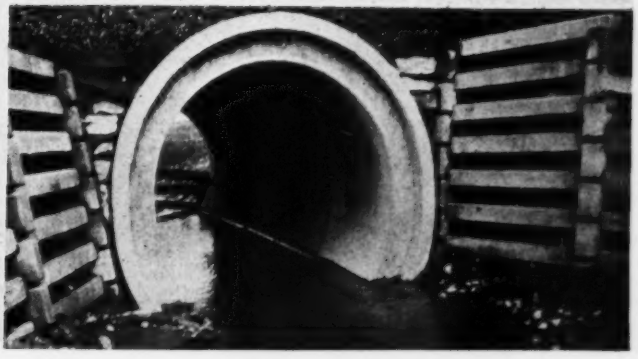
Massey engineers will be glad to make a suggested layout and estimate the cost of cribbing for any job you have under consideration. Catalog Supplement No. 20, describing this type of construction, will be sent on request.











MASSEY

Concrete Products Corporation, Peoples Gas Building, Chicago

Sales Offices: New York, Atlanta, Cincinnati, St. Louis, Los Angeles

Canadian Concrete Products Co., Ltd., Transportation Building, Montreal, Que.

Massey Cribbing is produced in the same plants and is of the same high quality as Massey Culvert Pipe and other precast concrete products which have been standard construction on the leading railroads for years.

RE&M6-Gray

TRASCO

TRADE MARK REGISTERED

"DON'T USE THE CAR COUPLER AS A BATTERING RAM!"

CARS ARE USUALLY STOPPED BY APPLYING PRESSURE TO THE CIRCUMFERENCE OF THE WHEELS THROUGH THE BRAKE SHOES

AT THE END OF YOUR TRACK, INSTALL
TRASCO CAR STOPS

PATENTED—12-21-26

HAVE MANY IN SERVICE FOR OVER SIX YEARS WITHOUT A SINGLE COMPLAINT.

AN ECONOMICAL SUBSTITUTE FOR BUMPING POSTS

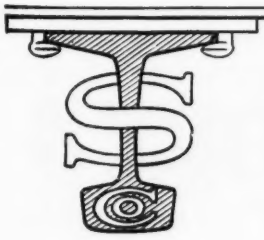
FURNISHED IN PAIRS EQUIPPED WITH BOLTS AND FILLERS.

IN ORDER TO DISPLACE A PAIR OF THE HEAVY DUTY CAR STOPS, THE MOVING CAR WOULD HAVE TO SHEAR TWELVE ONE INCH HEAT TREATED BOLTS.

WHAT BUMPER WOULD OFFER GREATER RESISTANCE?

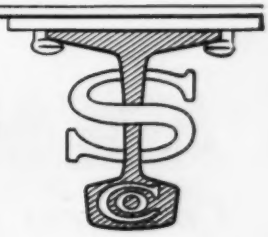
TRASCO HEAVY DUTY CAR STOP IS MADE OF ELECTRIC STEEL. IT IS 24 INCHES HIGH AND 36 INCHES LONG.

THE ELECTRIC STEEL CASTING IS MADE UNDER SPECIFICATIONS CALLING FOR 70,000 TENSILE, 25% ELONGATION AND 45% TO 65% REDUCTION IN AREA.

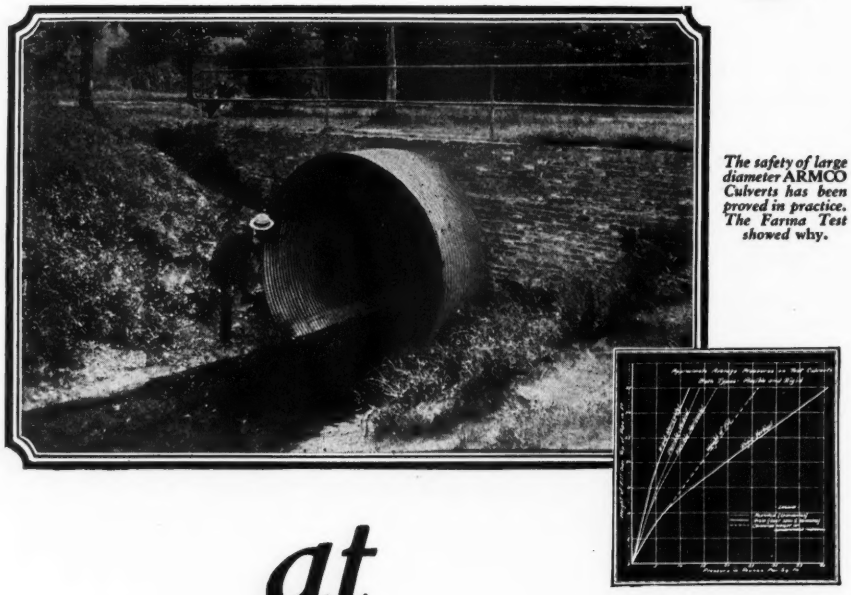


TRACK SPECIALTIES CO.

29 BROADWAY
NEW YORK



A safe small bridge



The safety of large diameter ARMCO *Culverts has been proved in practice. The Farma Test showed why.*

at culvert cost

ARMCO Culverts in diameters up to 108 inches have proved they make better small bridges. Their great strength resists strains from weight of fill or load of traffic. Their flexibility assures uniform distribution of pressure. Their simplicity permits rapid and foolproof installation.

And these better bridges give culvert economy, year-in, year-out. Their cost is no more than that of less satisfactory substitutes. It is always less than for built-in-place bridges. This economy applies to the entire life of the structure. ARMCO Culverts require no periodic repairs, no painting, no upkeep—no watching.

Large diameter ARMCO pipe is adaptable not only to safe, small bridges, but to under-crossings for any purpose such as cattle passes and public and industrial subways. Suggestions on how to apply this economy of culvert construction to *your* bridge problems gladly given on request—no obligation.

ARMCO CULVERT MANUFACTURERS' ASSOCIATION
MIDDLETOWN · · OHIO

ARMCO CULVERTS

Consistent performance because of consistent uniformity

NO CUTTING EDGES

COMPRESSES WITHOUT DESTROYING
A Single Fibre of the Tie

POSITIVE assurance against mechanical wear is the essential and scientific principle that removes the Lundie Tie Plate from the ordinary tie plate class and firmly establishes it as a truly economic device.

Unable by reason of this scientific design to cut a single fibre of the tie while holding track to rigid gauge, it guarantees a full 100% return on your cross tie investment. This tremendous yearly saving on cross ties is the most convincing argument for the Lundie Tie Plate because in every case it is backed by indisputable evidence of greatly extended tie life under the most severe operating conditions.

THERE IS NO SUBSTITUTE FOR LUNDIE

The Lundie Engineering Corporation
285 Madison Avenue, New York
166 West Jackson Boulevard, Chicago

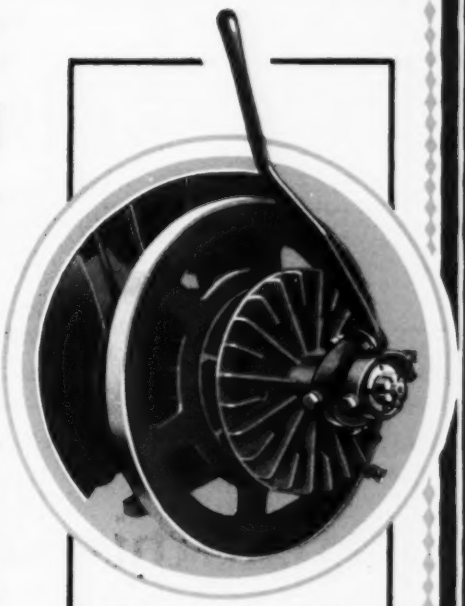
LUNDIE TIE PLATE

PRE-EMINENCE
that only unparalleled experience could produce

THE thirty-one years since Fairbanks-Morse built the first section motor car are marked by a constant procession of pioneering steps. The center load feature, the water-cooled engine, the gear drive, the chain drive, the free-running engine, the clutch drive, the two-cycle engine, the pressed steel wheel, the self-priming engine and the application of Timken tapered roller bearings are among the many developments that were first used in Sheffield Cars.

And of even greater importance to the railroad using Sheffield cars is the fact that every Sheffield improvement has been put into practice with a precision that only the unparalleled experience of Fairbanks-Morse could have made possible.

The clutch of the Sheffield "44," described opposite, is only one of many outstanding examples of Fairbanks-Morse refinement.



The clutch *everlasting*
—a typical Sheffield refinement

Even the automobile instruction book warns against "riding" the clutch. Yet in the Sheffield "44," Fairbanks-Morse has built a self-contained clutch of which it can be said: "Slip it as much as you want to—you can't burn it out."

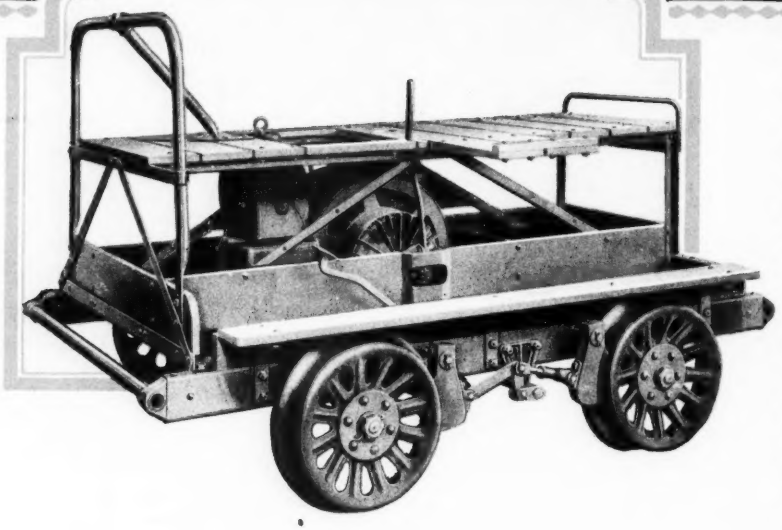
This innovation in clutch construction is a result of painstaking design of every element. Large surfaces. Special discs. Cooling fins that dissipate the heat. Perfect action. No thrust on bearings. These are just a few of many features that have made possible a clutch that is velvety in action, positive when engaged, and equal to anything you can "give" it.

FAIRBANKS-MORSE
MOTOR CARS

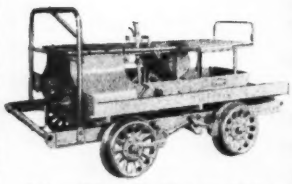
First on the rails *and still first*

TIMKEN EQUIPPED

Sheffield 44



Behind this popularity—*performance*
Behind this performance—*design*



Sheffield "40-B"

All that a fine motor car should be. Three-point engine suspension. Simplified friction transmission. Timken tapered roller bearings on drop-forged crank shaft and on axles. Positive force-feed lubrication. Auto-type pressed steel frame.

Ask for bulletin describing it.

Advanced design has placed the Sheffield "44" in the foreground of one-cylinder water-cooled section cars. Unlike most other cars of its type Sheffield "44" is provided with a positive chain drive operated through the clutch described on the preceding page. You can slip this mechanism as much as necessary when starting or maneuvering, but unlike other drives it slips *only when you want it to.*

This feature alone would set the Sheffield "44" distinctly apart from other cars of its class—yet it is merely one of many. Improved engine design cuts gasoline consumption to a minimum. A pressed steel auto-type frame provides strength with lightness. Every part is fully accessible, and throughout you will find countless evidences of quality that is duplicated in no other moderately priced section car.

FAIRBANKS, MORSE & CO., *Chicago*

Manufacturers of railway motor cars; hand cars; push cars; velocipedes; standpipes for water and oil; tank fixtures; oil engines; steam, power and centrifugul pumps; scales; complete coaling stations

FAIRBANKS-MORSE
MOTOR CARS

First on the rails — and still first

ARA21.24

SAVE 60% OF LABOR AND TOOL COSTS

WHAT ALL MAINTE-NANCE OFFICIALS WANT

TRY THEM ON TOUGH JOBS— THEY ALWAYS MAKE GOOD

Showing 3 Men Lining Track with 3 Hackmann Combination Track Liners
Saving Labor Cost of 4 or 5 Men
7 Men Can Do the Work of 15 or 20 Men

EFFICIENCY WITH ECONOMY

Now in use on over 100 railroads.

Results always far above expectations.

Labor costs cut in half.

Small and easy to handle. Weight only 20 lbs. Made of steel.

Lines track, frogs and switches.

Raises low joints and spaces ties.

Smooths rough track without disturbing road bed. Can be operated against the end of switch ties.

HACKMANN TRACK LINERS HAVE ALL THE ABOVE STERLING QUALITIES

Combination Lining Bar—Heat Treated

Combination Tamping Bar—Heat Treated

Hackmann Combination Track Liner

Hackmann Combination Track Liners are operated with the above special bar.

Hackmann Duplex Track Liners are operated with ordinary lining bar. Removable Fulcrum.

Note the Two Step Feature at top of base. You can make at least two pulls without resetting the liner. They can be left in track, allowing trains to pass over without any danger.

Hackmann Duplex Track Liner

WRITE FOR ILLUSTRATED AND DESCRIPTIVE LITERATURE

THE HACKMANN RAILWAY SUPPLY CO.

J. J. FRANZEN, *Secretary and Treasurer*

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ADDRESS ALL COMMUNICATIONS TO THE COMPANY

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THE RAILROADS ARE spending more than $200,000,000 annually for the insertion of about 100,000,000 ties.

How are you spending your share? How many ties do you renew per year? The quality of the ties and the character of their preservative treatment determine tie life and determine your annual renewals.

For example, a poor tie even if treated will last only 6 to 7 years. A sound tie properly seasoned and treated will last 20 years or more. The longer the life, the lower the cost per year, and the lower the cost of maintenance.

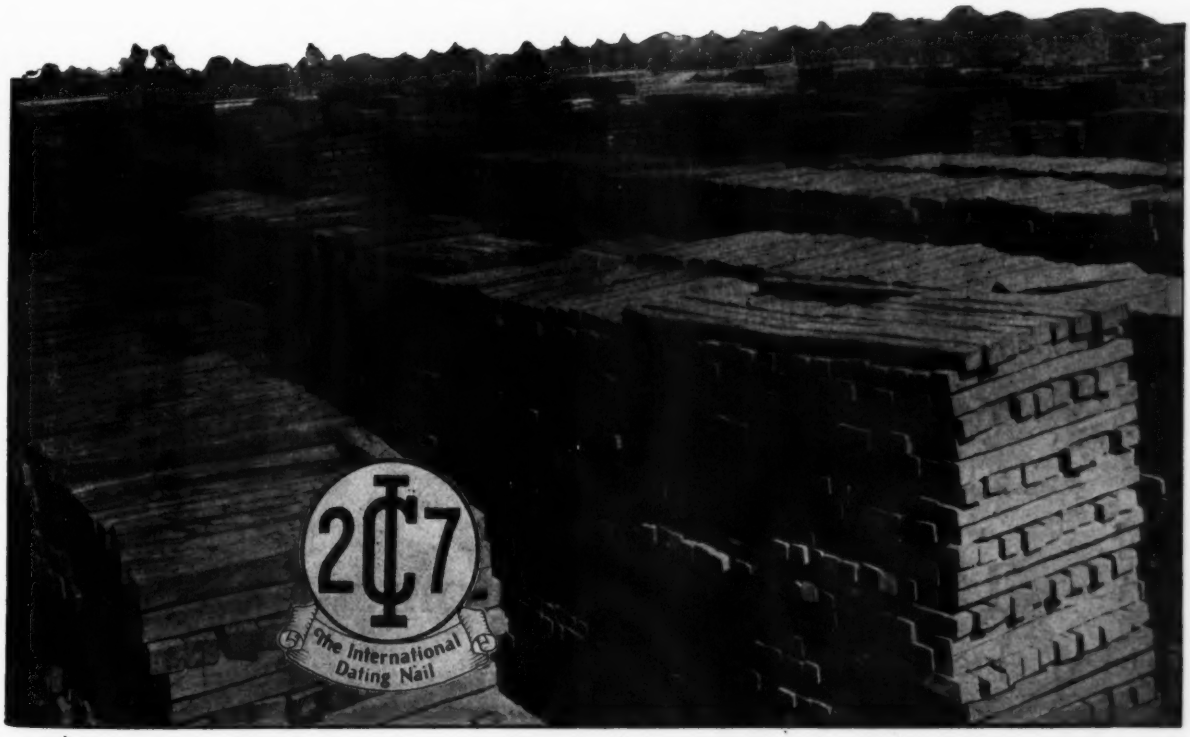
The reports of tie renewals shows that some great systems have annual replacements of only 125 or less ties per mile, while others with similar conditions renew as many as 225 ties per mile. The difference means an increased cost of maintenance of $275.00 per mile of track per annum.

Contract for International Ties now and save the difference

International

Standard A.R.E.A.
SPECIFICATION TIES

International Creosoting & Construction Co.
General Office—Galveston, Texas



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K & W Gas-Electric Rail Layer

Announce the appointment of the following Sales Representatives:

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Rank & Goodell,
906 Merchants Bank Bldg.,
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Walter H. Allen,
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In the New Sixty Million Dollar Cleveland Union Terminal

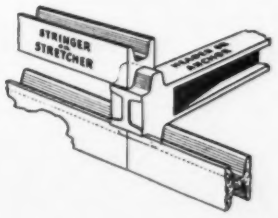
R. C.
RETAINING WALL
UNITS
Cut the Costs

BEHIND AND BELOW this towering structure are many permanent retaining walls built of R. C. Precast Concrete Units. In strength and appearance they meet the high standards of this great construction job.

This is only one of many times R. C. Units have been used by the Van Sweringens, who tested and proved them long ago.

The Pere Marquette; Ohio River Edison Company; Stevens & Wood, Inc.; Long Island R. R.; West Virginia and Colorado State Highway Departments; C. B. & Q. R. R.—are some recent users of R. C. Units.

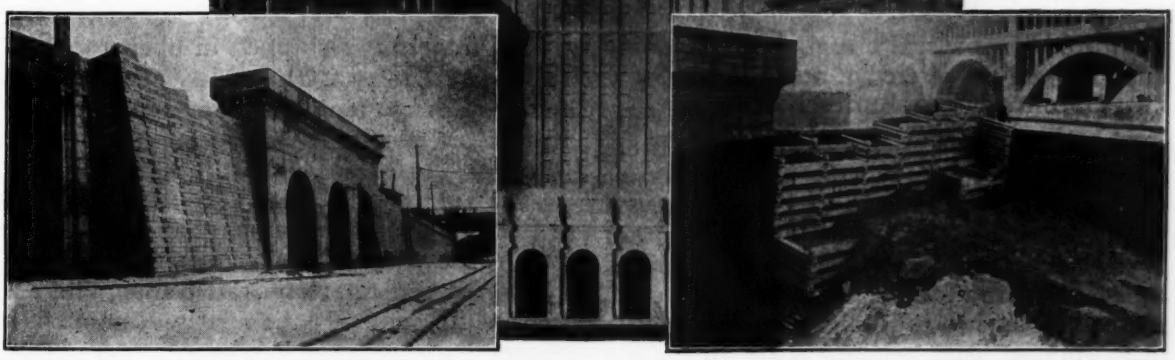
Impressive testimony—this distinguished patronage—to the economy and reliability of R. C. Construction!



R. C. UNITS are 100% adaptable to your cuts and fills. No detailed designs are necessary. Common labor places the units and follows with the backfill. No waiting for walls to set. No forms to build and tear down. Usually cost is cut over 50%:

BECAUSE—

1. **No Skilled Labor Required.**
   R. C. Units automatically interlock and square away.
2. **No Mason Work**
   No dowels, fittings, pillow or filler blocks.
3. **No Drainage Problems**
   And no massive foundations.
4. **No Salvage Loss**
   R. C. Construction is permanent or 100 per cent salvageable
5. **Assured Results**
   R. C. Units can be specified as definitely as structural steel.



R. C. Walls for embankment carrying re-located Columbus Road. Solid Fillers can be used with R. C. Units—as shown above.

This R. C Wall was built to a height of 32 feet, on a batter of only one inch to the foot.

SEND FOR THIS FREE BOOK

The R. C. Book contains illustrations of many typical installations—shows wall details and gives standard specifications. Also other useful information. Write or send the coupon for a copy—for present use or for your files.

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Send me your *free* book of Retaining Wall Data ☐
Also complete information on the use of R. C.
Units for the following purposes_____

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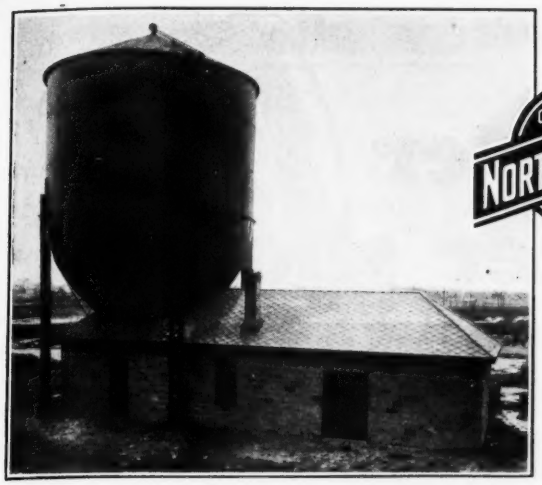
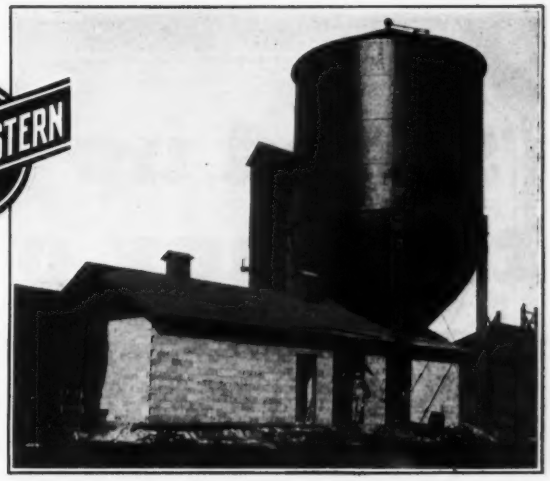


Mason City, Iowa



Council Bluffs, Iowa

For Better Water Service

These two water treating plants were built for the Chicago North Western road in 1925. The plant at Mason City has a capacity of 15,000 G.P.H. The treating tank is 42′ 3″ in height to the top with a storage capacity of 100,000 gallons and a 6′ downcomer. The plant at Council Bluffs has a capacity of 20,000 G.P.H. The treating tank is 50′ in height to the top with a storage capacity of 125,000 gallons and a 6′ downcomer.

The steel tanks were designed, fabricated and erected by our company; all treating equipment (Roberts water motors, chemical vats, agitators and pumps) and all interior piping was furnished and installed by us. The foundations and buildings were handled by the railroad.

Submit your plans for tanks, treating plants or pumping stations to the nearest Pittsburgh-Des Moines office for estimates. Or ask an engineer to call and discuss your work with you. We offer you a complete general contracting service, backed by thirty years of experience, on any work involving water supply, treating or storage.

Send for our new Railway Catalog No. 72

Pittsburgh-Des Moines Steel Company

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PITTSBURGH DES MOINES

"Stand up better than any other shovel"—

That's what Mr. Patrick McGovern of New York writes about OLIVER AMES Shovels to Charles J. McCarty & Company, well known contractors' supply house of Boston.

Mr. McGovern says—"We wish to advise you that we have used the Oliver Ames Shovels very extensively and under very severe conditions, in tunnels and other rock work. These shovels have stood under this service better than any other shovel that we have tried, and have proved to be very satisfactory in every way."

OLIVER AMES Shovels in tunnel construction—OLIVER AMES Shovels along the tracks of transcontinental railroads—OLIVER AMES Shovels in coal and ore mining—at the mixer with road-builders and contractors—in rock, sand, ballast or loam. OLIVER AMES Shovels stand up better in service, hard usage, and economy.

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Catalog of all sizes and types on request

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At good supply houses everywhere

AMES SHOVEL AND TOOL CO. - - - Ames Bldg., Boston
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Railway Engineering and Maintenance

Volume 23 June, 1927 Number 6

KNOW YOUR STOREKEEPER

A REPORT presented before the convention of the Purchases and Stores section of the A. R. A. in Chicago last month called attention to the variation in practice with respect to tie layouts for turnouts. Some roads vary the length of switch ties by 3 in., others by 6 in. and still others by 12 in. It goes without saying that a layout with ties changing length by only 3 in. will look better than one in which the change is made in jumps of 12 in. But that is something that does not concern the storekeeper. He prefers the 12 in. interval because a switch tie layout would then have only about one-fourth as many items on the bill of material and his problem of keeping a stock to protect the demand would be correspondingly reduced.

Cases can also be offered of substitutions by the supply department of something which was presumed to be *almost* the same as what was called for on a requisition but which, nevertheless, was entirely unsuited to the purpose intended. Regardless of who is at fault, however, lack of coordination between the using and supplying departments results in wasted energy, discord and loss of time. Make it a point to know your storekeeper.

LARGE LOCOMOTIVE TENDERS

WHILE the design of a locomotive tender is commonly considered of interest, primarily, to mechanical department officers, an announcement made a few days ago by the Norfolk & Western that it will build 30 tenders with 18,000 gal. water capacity is of interest to engineering and maintenance officers as well. While these tenders will not establish any new records in this respect, as the Great Northern built and placed in service 17 tenders of 21,500 gal. capacity last year, they are sufficiently unusual to attract special attention. The decision to build these tenders comes after the completion by the same road of tenders of 16,000 gal. capacity, 30 of which were authorized last year, and is in keeping with the trend of the times.

Prompted primarily by the constantly increasing size of trains and the correspondingly greater consumption of water in the generation of steam, the immediate effect of the added capacity is nevertheless to increase the "cruising radius" of the locomotives so equipped or to increase the distance possible between stops for water. This creates new problems for the water service department for it permits it to give preference to certain water stations and to provide sufficient capacity at points where an adequate and dependable supply of water of good quality can be provided at reasonable cost and to restrict the consumption of water at other less favored points. As the use of larger tenders becomes more common many opportunities will be presented to water service officers to develop their supplies more economically and they can well afford to bear this thought in mind in the formulation of plans for new stations and for the reconstruction of existing stations.

These new tenders are also of interest to maintenance of way men by reason of the loads they will place on the track. They will be 44 ft. 7¼ in. long and with the locomotive will have a combined length of 102 ft. Their weight when filled with water and with 26½ tons of coal will be approximately 314,300 lb., distributed between six axles, giving an average load per axle of more than 52,000 lb., approaching that of a locomotive.

THE MAGNITUDE OF ROADWAY EXPENDITURES

THE railways of the United States spent $573,164,000 for additions and betterments to roadway and structures facilities chargeable to capital expenditures during 1926, or more than in any previous year on record, according to data compiled by the Bureau of Railway Economics and made public by the American Railway Association on May 24. These expenditures comprise 58 per cent of all expenditures made by the railways chargeable to capital account during the year, a larger proportion than in any recent year. They are in addition to $874,244,048 spent for the repair and maintenance of existing roadway and structures facilities during the year.

Two things stand out prominently in these figures. One is the magnitude of the expenditures which the roads are making to maintain and to expand their present roadway facilities, the combined totals chargeable to both capital expenditures and operation being $1,447,408,000. The enormity of this expenditure can be realized better by stating it in smaller terms. Thus, these expenditures were made at the rate of $4,825,000 per working day, which is again at the rate of $600,000 per hour, based on an eight-hour working day, or $10,000 per minute. It is through these expenditures that the roads have been able to bring their properties up to sufficiently high standards to enable them to render the unprecedented service that they gave American business and the American public last year in both capacity and regularity of delivery.

The second thing that stands out prominently in the study of these figures is the steadily increasing proportion of the total expenditures for capital improvements in recent years that is going for roadway and structures as compared with equipment.

This is shown by the fact that as recently as 1923 only 36 per cent of the total expenditures went for roadway and structures as compared with 64 per cent for equipment; while in 1924 roadway received 44 per cent; in 1925, 55 per cent; and last year 58 per cent of the total expenditures for capital improvements. This money has been spent for more tracks, new buildings and other facilities to handle a growing traffic, as well as for heavier rail, more ballast, stronger bridges, larger water and coaling stations, etc. It is through the improvement of facilities of this character that it has been possible to utilize the cars and locomotives more efficiently and thus render greater service with the same or an even smaller amount of equipment.

It may reasonably be expected that improvements of this character will continue to be made, for much work yet remains to be done before the roadway facilities may be considered fully adequate. There are few roads on which there is not yet much work to be done which will yield 15 to 25 per cent on the investment, in the form of reductions in operating expenses. It is by the elimination of such conditions that a larger proportion of the gross earnings of the roads are being converted into returns for the stockholders, while at the same time the patrons are given better service at reduced cost.

WATER TROUBLES

THE railroad man thinks of drainage as an important requirement for the maintenance of the roadbed in a state of equilibrium. In its larger sense, however, drainage, or run-off, has been and always will be a great force in producing change; it is the great leveler that is gradually flattening out the earth's surface by carrying earth, sand and stone from the hills and mountains into the valleys. Where the flow of water is rapid it digs cuts; where the flow is decreased it builds embankments. As the earth gets flatter this action decreases, water follows established courses and the changes are less pronounced.

In building a railroad the contours of hills and valleys are changed to suit the needs of a roadbed on a required gradient. Natural drainage is disturbed in many ways; in fact it is only where a railway occupies the ridge of a watershed or where the country is so flat as to be substantially without drainage that it does not interfere in some way with the natural drainage. In all other locations it is either crossing waterways or obstructing the flow of the cross drainage into the waterways. In other words, the building of a roadbed tends to upset the state of partial equilibrium that nature has established in the leveling process carried on through the ages.

It is not surprising, therefore, that provision for the disposal of run-off water is one of the big problems of the railroad builder. But he cannot be expected to learn as much about the physical facts of a given locality in the short space of time that he is occupied in locating and building the line as may be expected of the maintenance man who must live with the line from year to year. Furthermore, the builder must make his decisions while thinking of the location as it will be, while the maintenance man can *see it as it is.*

Much must, then, be left to actual experience with sudden thaws, spring floods and summer "cloud bursts" for many years before it will be possible to meet all the conditions that will demonstrate where side wash will occur, where culverts are inadequate, where surface ditches are too small or cut slopes too steep. The surprising thing about the period of heavy and protracted rainfall that has been imposed on the Middle West during the last two months is not that it resulted in some traffic tie ups, but that it interfered so little with rail transportation. It is only because the results of these recurring periods of high water and scour have been studied that the railroads are now so singularly free from their disturbing consequences.

THE MAINTENANCE OF MOVABLE BRIDGES

A REVIEW of the advance in bridge engineering during the present century leads to the conclusion that the greatest progress has taken place in the field of movable bridges. Whereas the swing span was once so common as to be properly termed the standard type, it must now compete for consideration with the vertical lift span and several types of bascule bridges of demonstrated merit. Furthermore, the demands of shipping interests and the United States War Department for ever-increasing widths of waterway openings, and the growing weight of rolling stock, have imposed the necessity for building longer and stronger movable spans, which means that the loads to be swung, lifted or tipped up are much greater than they used to be. This in turn means heavier machinery and more powerful power units.

Two other influences have also affected development. The power unit of a movable span is a standby unit. On many bridges it is rarely in actual service but must be ready for use on exceedingly short notice. For this reason the steam engine, which must be attended by a boiler that is always kept under pressure, is exceedingly inefficient and has been largely supplanted by the electric motor and the gas engine. In addition, the greater refinement in the precautions against railway accidents has led to marked improvements in the facilities for the control of train movements at channel openings in bridges. As a consequence, the mechanical equipment for the operation of bridges is much heavier than formerly and more varied in type, and the control apparatus is much more complicated. So, while such bridges are virtually fool-proof, insofar as concerns the possibility of accidents resulting from an error on the part of the bridge tender, the need for expert supervision of maintenance is far greater than formerly. That all railroads have not fully recognized this is indicated by the observations of an engineer who specializes in certain phase of movable bridge design and constructon. He has found that the bridges on certain railroads are not receiving the attention necessary to insure that all parts are kept in a condition which will insure against the wear or deterioration that will lead eventually to heavy repairs or renewals.

Adequate inspection and supervision of the maintenance of modern movable bridges implies more than mere vigilance and attention to duty on the part of the individual responsible for it. It demands also that he be thoroughly competent, that he clearly understand the complex apparatus in his charge. These great movable spans represent enormous investments and the railroads can ill afford to allow them to suffer deterioration through neglect or incompetence on the part of those responsible for their inspection and maintenance.

MOTOR CARS AND ACCIDENTS

IT is evident from letters that we have received from some of the manufacturers of motor cars that we failed to make clear our position regarding motor cars and motor car accidents in an editorial on this subject, published in the last issue of *Railway Engineering and Maintenance*. In that editorial we referred to the number of accidents that are occurring among maintenance of way employees incident to the operation of motor cars, and to the hesitancy on the part of some railway officers to extend their use on account of this condition. We also attempted to show that these accidents were the result of carelessness in the operation of the cars.

The motor car is widely used today—in fact so widely used that it is commonly regarded as standard equipment for maintenance of way gangs. Its economy is so thoroughly established that it is no longer open to question. Yet there are not a few locations on many roads and, in fact, not a few roads, where motor cars are not yet used where they could be employed with economy. The principal consideration retarding their use is the fear, real or fancied, of accident. If this fear can be removed the use of motor cars will be increased with resulting profit to the manufacturers and economy to the roads.

It was in an endeavor to aid in the solution of this accident problem that we called attention, in the editorial to which exception has been taken, to the fact that while some roads are confronted with numerous accidents, others operating under similar conditions are relatively free from them, and we suggested that one should be able to learn something from the methods of operating motor cars on the roads of the latter class.

It is our position that most motor car accidents are preventable and that they result from carelessness or the taking of chances by those operating the cars. They are, therefore, failures of men rather than of the cars themselves. The problem is to so train and supervise the men that they will operate the cars safely. This calls for the promulgation of rules or instructions for the guidance of those operating cars, covering such conditions as speed, the manner of approaching highway crossings, the interval between following cars, etc. But such instructions are already contained in the standard books of rules for the government of maintenance of way employees on most roads. The mere drafting of rules and instructions is not, therefore, enough for the control of accidents.

The safe operation of cars calls also for the enforcement of the rules thus drawn, by adequate supervision and by the punishment of infractions by the application of discipline. The first step in this enforcement is for supervisory officers themselves to become sufficiently impressed with the importance of this subject to observe the precautions and instructions that they have provided for their men. Herein lies one of the greatest obstacles at present, for in many cases the supervisory officers themselves disregard these rules freely, taking chances which are in direct violation of instructions. That they are no more immune to accidents than their men is shown by the disproportionately high number of roadmasters and divison engineers who are being killed and injured in this way. When men of this rank become sufficiently impressed with the necessity for the observance of the rules that past experience has demonstrated to be necessary, the greatest step will be taken in the reduction of accidents, for it will then be easy to enforce similar observance of rules among foremen and other operators of motor cars.

One division superintendent on a middle western road solved this problem, as far as his territory is concerned, by issuing notice that any of his men involved in a motor car accident "might just as well keep on going" for their positions would no longer be open for them. As a result, on his division, there have been no motor car accidents for more than three years. When other operating and maintenance officers become similarly alive to the importance of this subject and place the same insistence on their men operating their cars carefully, and then investigate each accident fully to locate and to place the blame. the number of accidents will decrease greatly and the motor car will come to the full realization of the place that rightfully belongs to it as an economical unit of equipment for maintenance of way gangs.

RELEASE CARS PROMPTLY

IN reports submitted to the board of directors of the American Railway Association by the Car Service Division of that association on May 27, a plea is made for the more intensive use of cars and the economies which it is possible for the railways to effect by such measures are pointed out. In this report the Car Service Division sets certain goals which include the increasing of the average load per car by at least one ton and the more prompt unloading and release of cars sufficient to effect a reduction of at least 20 per cent in demurrage, as compared with 1926.

In the use of "company equipment" for the transportation of their materials, maintenance officers are prone to overlook the cost of this service and to consider only the evident out-of-pocket expense resulting from the use of locomotives in work train service and of the labor in their gangs. As a result they all too commonly consider the convenience of their forces, to the neglect of the cost of holding cars under load when they might be released for revenue service. Much economy can be effected in the use of equipment by arranging for the more orderly shipment of materials to avoid "light loads" of supplementary materials overlooked when the original requisitions were made or unavailable when the first shipments were made because of the lateness of receipt of the requisitions. It is as important to a railway that its own employees consolidate their shipments into full car loads as it is to encourage this practice among its patrons.

A still greater improvement in the handling of equipment can be effected, however, by supervisory maintenance officers insisting that cars be unloaded and released as promptly as possible. It is not unusual for cars to be held under load for weeks because it may not be convenient to send a gang to unload the materials. Such a condition can and should be corrected, either by providing the shipper with more accurate information regarding the date on which the material is needed or, if necessary, by incurring extra expense occasionally to release cars.

While the primary responsibility of maintenance forces is for the economical conduct of business, they of necessity bear a responsibility also to other branches of railway service to conduct their operations in such a way that the interests of the other departments and the interests of the railway as a whole are likewise promoted. The efficient use of equipment by the maintenance of way department is one means to this end.

What Our Readers Think

THE PILING OF TIES

I was much interested in Fred F. Franklin's article entitled "Methods of Stacking Ties Influence Rate of Seasoning" which appeared in the January issue of *Railway Engineering and Maintenance*. I agree with Mr. Franklin that it is necessary to provide ample air space at the base of the piles but to my mind the standard one-by-nine practice of piling is by far the best and I do not like to depart from it to the extent of adopting what he calls method No. 2 in place of the more common method which he designates as No. 1.

Why not provide the necessary air space in building the skids and then start the one-and-nine system directly on the skids? For bottom sills we use old treated cross-ties laid on the ground; on these we place old treated bridge ties, stringers or switch ties. The whole skid-way or "pile bottom" is spiked

Well Constructed Pile Bottoms Insure Air Space under the Ties

together with boat spikes and this makes the pile bottom practically permanent and stationary. Each time the skid is uncovered, it is leveled up and lined into place with a bar if necessary, at which time any poor members can also be replaced readily. Once a yard is equipped with such pile bottoms, the maintenance is light and the piles are uniformly spaced and are straight, both longitudinally and vertically. It is a small job to level skids with a track level and to tamp up the low places. This also keeps the skids from settling into the ground. At the same time the tops of the skids are painted with hot creosote to cover any scarred places and to prevent pile burn on the bottom course of ties.

The great advantage of the No. 1 method of piling cross-ties is that it makes for simplicity and accuracy when taking annual or periodic inventories; of tallying the unloading of cars, etc. We always complete each pile by placing a tie on top, thereby completing this top one-and-nine row. Therefore, it is seen at a glance that a single pile 10 rows high contains 100 ties; and that a stack 15 rows and 4 piles deep contains 600 ties. With the extra tie on top, as shown in the picture, the last or top row contains 10 ties instead of 9, making the piles tally up in figures that are more quickly handled.

The same class of permanent pile bottoms is used for other material than cross-ties, care being taken, of course, to provide intermediate members to prevent excessive sag in storing long timbers.

H. B. HOYT,
Superintendent Timber Preserving Plant,
Buffalo, Rochester and Pittsburgh.

New Books

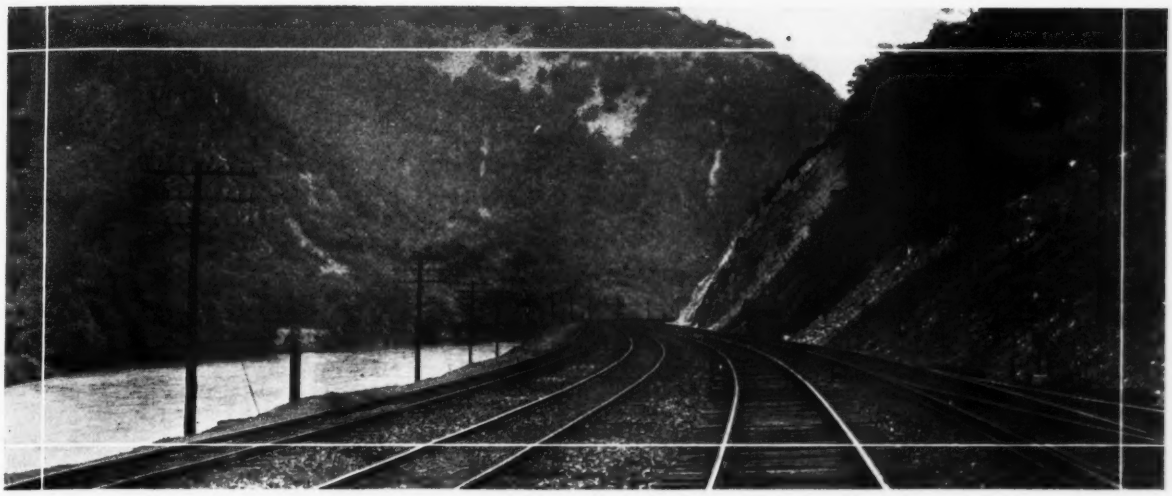
Track and Turnout Engineering, by C. M. Kurtz, Assistant Engineer, Engineering Department, Southern Pacific Company, San Francisco, Cal., 457 pages, 4⅛ in. by 7¼ in. Illustrated. Bound in cloth. Published by the Simmons-Boardman Publishing Company, New York. Price $5.

This volume is arranged as a handbook on the design and installation of railroad turnouts and crossings, as well as the field work and computation necessary for track connections under various conditions and was prepared as a revised and enlarged edition of "Modern Location of Standard Turnouts," written by the same author in 1910. In order that the young engineer unfamiliar with the subject may acquire a full understanding of the principles governing the work, several chapters are devoted to the design of frogs, switches and crossings, including recommended designs adopted by the American Railway Engineering Association. The definitions as well as the preferred names for the various parts of turnouts and crossings as adopted by the A. R. E. A. are given in appropriate chapters and are used in the text.

The treatment of the various problems is based on mathematical accuracy but cognizance is taken of the practice of placing turnouts in existing tracks with reference to joints to eliminate as far as possible the cutting of rails and hence will be found equally adaptable for maintenance of way and construction engineers. Throughout the book stress is laid on the importance of taking into account the operating conditions to be met. The mathematical solutions for the different problems are simple and logical and the diagrams which accompany them are so clearly presented as to be a material aid in following the various steps.

Tables are given in the back of the book, covering all data necessary for the computations, thus making the book available for use in the field as well as for reference in the office or library. Included in the tables are several which give values for certain elements used in formulas for the solution of problems involving the locations of connecting tracks from either straight or curved tracks. While these are based upon fixed lengths of frogs they may be adapted to any length of frog by simple mathematical computations and will be found to simplify many problems involving the location of turnouts.

In addition to the matter pertaining to turnouts, crossings and track connections, separate chapters are devoted to vertical curves and to easement curves and superelevation, in which consideration is given to the principles which should govern their use, especially in mountainous country where long easement curves may necessitate heavy construction.



How Can the Quality of Steel Rails Be Improved?*

Co-operative Efforts by the Railways and the Manufacturers Are Suggested to Solve this Important Problem

By C. W. GENNET, JR.

Manager Rail Department, Robert W. Hunt Company, Chicago

THE one hundredth anniversary of the first railway in the United States was fittingly celebrated a few months ago. The Granite Railway, which was opened for traffic on October 7, 1826, consisted of 2¾ miles of so-called track which was built of crushed granite, with stone sleepers eight feet apart, on which rested wooden rails 12 in. high. On top of the rail was an iron plate 3 in. wide and ½ in. thick, which was fastened with spikes. But wooden rails with strips of iron have passed and the speed of a fast walk has given way to nearly 100 miles an hour at intervals. The original 2¾ miles of road has grown to something over 250,000 miles, comprising probably 400,000 miles of track which require approximately 2,000,000 tons of heavy steel rails to maintain properly, illustrating the rapidity of the changing conditions with which engineers have been confronted.

C. A. Morse, chief engineer of the Chicago, Rock Island & Pacific, has recently given figures of the trend of practice in which he states that for one western road the average weight on drivers for all locomotives in 1905 was 49.62 tons and the average total weight of the locomotives was 66.19 tons. In 1925 these figures were 85.66 tons and 106.68 tons respectively, or an increase in 20 years of practically 75 per cent. He adds that in 1905 the weight of rail commonly used was about 85 lb. per yd. and that subsequently it was increased to 90 and 100 lb. and in some cases to 110 lb. per sq. yd. or more. While the weights for locomotives just given are averages for one road they no doubt represent fairly general conditions and are undoubtedly exceeded when the heaviest locomotives on some roads are considered. Notwithstanding the increase in the weight and strength of rails, the weight of rails in use has not kept pace with the increased weight of locomotives.

Freight cars also have their story of increased weight, as great in some cases, if not greater than the axles loads of locomotives; in addition there is the great factor of train frequency or tonnage that the rails have to carry. Thus the problem becomes complex, made seemingly simple by the prescription that when heavier locomotives and cars are required all the rails of a lighter weight should be taken up and correspondingly heavier ones put down. But budgets are carefully pruned and even heavier rails have not always been the panacea expected, so that the engineer seeks co-operative effort not only from motive power officers but also from the rail manufacturers with the hope that the former will make the loads to carry as easy as possible and that the latter will make rails that are safer and possessed of longer life.

Studies of Track Stresses

Railway engineers are fast becoming familiar with the work done by Professor Talbot in determining the stresses in rails under the normal conditions of track and traffic, in which the stremmatograph has been made to obtain results of immeasurable benefit. Consider for a moment a modern passenger locomotive with seven pairs of wheels and with drivers 17 ft. in circumference. One revolution of the driver at a speed of 60 miles an hour requires about 0.2 seconds and in that interval the stresses occurring in the rail have been computed for each position of the counterbalance throughout a complete revolution and

*Abstracted from a paper presented before the New England Railway Club at Boston, Mass., on April 12, 1927.

the stresses caused by each of the other wheels have also been established.

In general the stresses in rails have been somewhat underestimated and considerably more is frequently required of rails than was supposed. Maximum stresses of 60,000 lb. per sq. in. were found to occur in the bases of 90-lb. rails on 10-deg. curves, and while these were exceptional other results indicate the absence of any such factor of safety as is present in the computations of other steel structures. An interesting thing brought out by the tests has been with respect to the bending action in rail induced by the traffic. The so-called "wave motion" is well known, but in addition the rail has a lateral bending movement between two drivers for instance, amounting from 0.1 to 0.4 in., according to the track and curvature. Thus a twisting action results from the vertical and lateral movements which may be important when considering certain types of broken rails for it has often been assumed that rails were subject only to vertical strains and so of a comparatively simple character.

Last year a paper was presented before your club by Mr. Lanning, mechanical engineer of the Santa Fe, describing some of the uses that motive power men could make of the data. Counterbalance, equalization, lateral movement, the action of the wedges, flat wheels and other details have an important influence on rails and as Mr. Lanning very aptly said, "Reduction of track stresses is important not only from the standpoint of safety and reduction of track maintenance but also from the standpoint of locomotive maintenance."

Rail Wear and Rail Breakage

Most railway officers consider that rail breakage is paramount to rail wear, but the trend in many cases is an effort to so improve the wearing qualities that an element of risk is introduced. A chief engineer of distinction is reported to have said in effect that the rail problem consisted of making all of the rails as good as the average—a statement in which all would concur if it were not for the fact that frequent failures occur in what often may be regarded as rails of the best quality. In my experience, all specific complaints involving wear have been confined either to rails laid on curves, where track and traffic conditions impose extraordinary burdens, or when laid on tangents, to a foot or so of the ends, where the effect of the joints is chiefly responsible, and the customary attempt to make the steel more resistant to curve wear or batter is liable to bring trouble of another kind. Rails for curved track, coupled with the actual track and traffic conditions of curves, should constitute a special problem as against the 80 or 90 per cent of straight track mileage and deserve to be treated separately by being specially selected and possibly of heavier sections.

A prominent western railway noted for the excellence of its track and the accuracy of its rail records, had exactly 2,700 broken or failed rails in the 12 months ending on October 31, 1926, on a total of 4,716 miles of track. Five hundred and eighty-six or 21 per cent of these failures were due to transverse fissures, universally recognized as the most dangerous type of failure, while 1,773 or 65 per cent of the failures were of the head type, which, while not particularly dangerous, are cause for constant anxiety and additional expense. This railway therefore, had slightly more than 7 rail failures every day while a transverse fissure showed itself every 15 hours. This is an alarming record, since safe rails are the crux of the rail problem. The public demands safe traveling and the railways, in seeking safer rails, inquire how they can obtain them.

Old and New Methods of Making Rails

Let us compare modern rail making methods with those of 30 or 40 years ago. Bessemer steel, of course, was rolled in the old days and heat after heat of 10 or 12 tons was made with almost exactly the same chemical composition. Now it is open-hearth steel from 100-ton furnaces with a considerable range in the composition of the heats, so that one may be high in carbon and manganese and the next so low in those elements as to be noticeably different. The ingots in the old days were comparatively small, of perhaps 3,000 lb. weight; present ingots may be 24 in. square, 80 in. high and weigh from 12,000 to 14,000 lb. The old ingots and the present are cast in exactly the same way by pouring from a hole in the bottom of a ladle into the top of the molds. The probabality is that the big ingots pipe and segregate more than the small ones and certainly the heating of them is much more difficult while the higher carbon content of the open hearth steel invites more harmful segregation and susceptibility to damage in heating.

The old ingots were rolled to 5-in. rails in practically the same number of passes given to the large ingots now rolled to 6½-in. rails and finally the old rail was cold-straightened in a gag press exactly as is the custom on the rails of 0.85 per cent carbon today. While not unmindful of the metallurgical, mechanical and electrical ingenuity of present day methods it must be admitted that the old methods had much to commend them and that in some ways the practice of today has not kept pace with the demand for high grade rails in the modern sections. It is manifestly impossible to think of altering many of the existing conditions. The open-hearth process is here to stay, with its attendant large ingots and various uncertainties, but some things can be changed by proper co-operation and it is fitting to consider some of them.

Many Failures in "A" Rails

Fifty-four per cent of all the head failures mentioned above were in the "A," or top rails, of the ingots. The metal used in making "A" rails has long been known as the most unfit of any for rails, and may be chemically segregated, physically unsound, or both. "A" rails comprise about 12 per cent of all that are laid, yet in this instance, as in others, they have provided over half the failures. They are sold at the same price as the superior rails from lower parts of the ingots. It has been proposed to roll the metal that makes them into tie plates and this suggestion has met with fair response but is handicapped by the extra price required. Nevertheless the plan will have a strong appeal until the adoption by the mills of some practice assuring the making of sounder ingots.

It may be assumed that the heavier rails, receiving less actual work in rolling, can stand the addition of more hardening elements to resist wear better, and as a consequence the carbon has been increased practically to a point recognized as on the border of that which makes for brittleness as against ductility. It would seem more desirable to modify the composition of rail by endeavoring to improve ductility

through a replacement of the carbon with some other element and this has been done in the case of the medium manganese steel now being tried by a number of roads. This practice entails considerable extra cost, the value of which may be more doubtful than is the benefit derived from eliminating the "A" rails, but the experiment shows a disposition to give more study to the composition of rail steel. Some of the Bessemer rails with a top limit of 0.06 or 0.07 per cent of phosphorus and with carbon around 0.55 will never be forgotten and it might be desirable at the present time to try rails made to such a composition by the open hearth process. In addition, several hardening, toughening and strengthening elements are recognized as fit for special purpose automobile steel that might prove by trial to be suited for rail steel, even when not specially heat treated.

It is certainly not amiss to mention the increased work that in most instances can be given to rail ingots in reducing them to rails. Some of the old school do not regard the rapid passing through the rolls or the slower movement with frequently a reduction of as much as 25 per cent in one pass, as sufficient "work" on the steel. Refinement of the grain structure is, to a large extent, a matter of heat treatment and control but surely there is some mysterious thing about steel that has to do with the energy used in shaping it and whether the heavy rails are getting the energy applied in a manner to achieve the best results is worthy of further study.

Damage to Rails by Straightening

Straightening rails is a damaging process at best and as the rails have become stiffer, with the carbon content frequently at the saturation point, it is impossible to predict when some interior rupture of the grain will result from the blow of the gag. It has been left to the Germans to show the way to straighten rails in a roller bending machine. While by their method the rail must also be strained beyond its elastic limit the manner of doing it is of more than passing economical and physical importance. Not only were the Krupp rails shipped to the Boston & Maine last year roller-straightened but they were made from ingots cast from the bottom, instead of the top. This practice, tried in the United States, has not been freely regarded as superior to top casting but, be that as it may, not a single piped rail was found among the 15,000 tons tested and inspected under rigid conditions at the Krupp plant. The service that these rails give will be watched with interest.

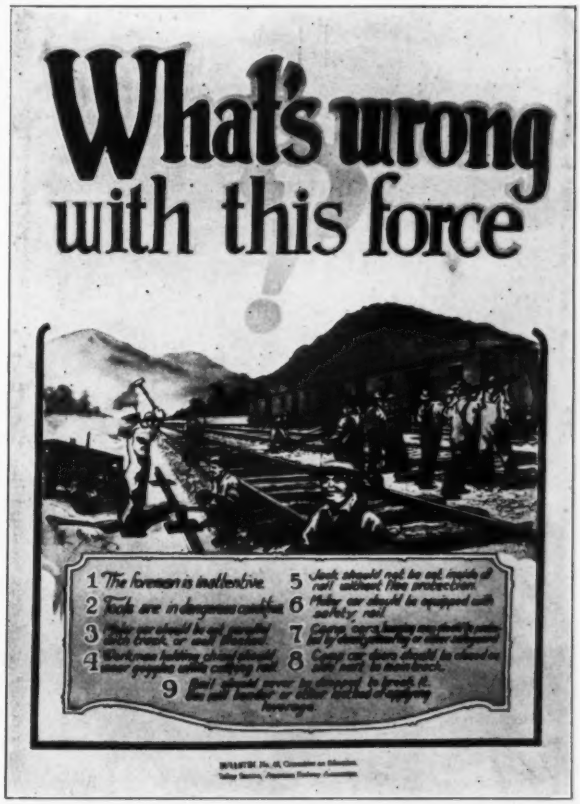
No single man, and probably no group of men, can write a formula that will cure the troubles with rails. Neither a better distribution of wheel loads nor heavier or special rails will probably ever eliminate broken or otherwise defective rails. Railway officers who formulate rail specifications are busy men and, as the line of least resistance is sometimes the easiest to follow, the specifications are apt to be a compromise, with the result that the improvement aimed at is either beclouded or is inadvertently lost.

Rail Makers Should Assume More Initiative

Manufacturers in other lines have been largely instrumental in assisting the railways in the development of new devices such as locomotives and signals and it seems to me that the time has come when the rail makers should assume more initiative and instead of being passive to the point of appearing indifferent or reluctant should undertake, either singly or collectively, a campaign toward the improvement of that which has long been regarded too ethically as purely the buyers business. Such a spirit should be welcomed unhesitatingly by the railways and taken advantage of wholeheartedly. The expenditure of $100,000,000 for new rails each year, together with the responsibility toward the public that cannot be figured in money, is sufficient to urge a more constructive effort from all directions. Rail manufacturers can assist materially in this matter by a more generous application of their resources and talents.

Reduce Accidents in June

The maintenance of way department has been selected by the Committee on Education of the Safety Section, American Railway Association, for special attention during the month of June and a poster, Bulletin No. 45, has been issued for distribution among maintenance of way forces. These monthly

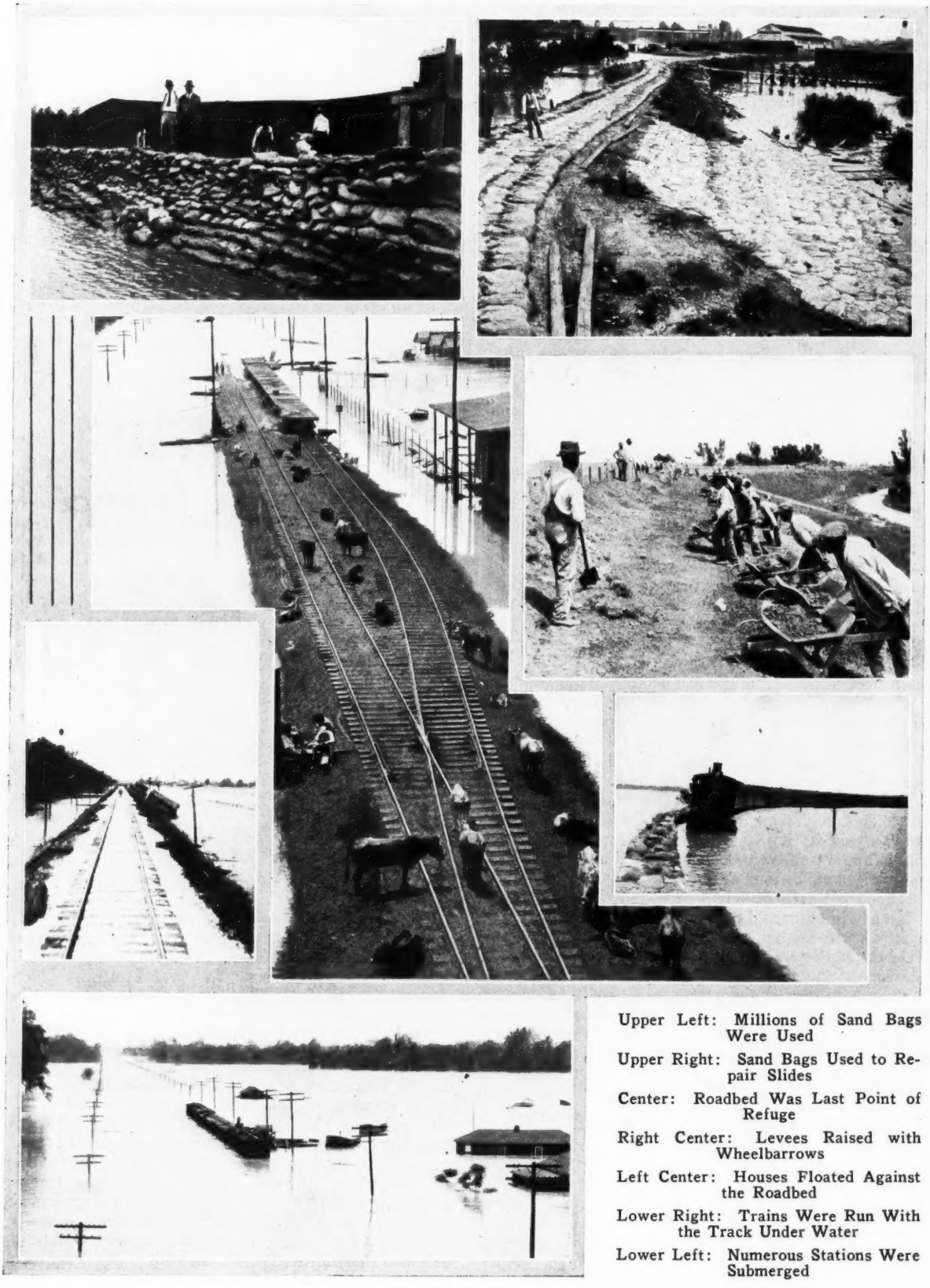


Safety Section Bulletin No. 45

bulletins are a part of the program inaugurated in 1923 to reduce accidents 35 per cent by 1930.

In this circular regarding maintenance of way employees, Chairman Bentley of the Committee on Education emphasizes the fact that nearly one-half of the employees killed were struck by trains, and calls attention to the need for alertness on the part of men, care on the part of foremen and obedience to the rules requiring all men to move clear of all tracks on the approach of a train. Foremen are reminded that the frequent employment of new men can swell the accident figures and are cautioned to select and train such men carefully and pair them with trustworthy men of experience when they are set to work.

The Story of the Mississippi



Upper Left: Millions of Sand Bags Were Used

Upper Right: Sand Bags Used to Repair Slides

Center: Roadbed Was Last Point of Refuge

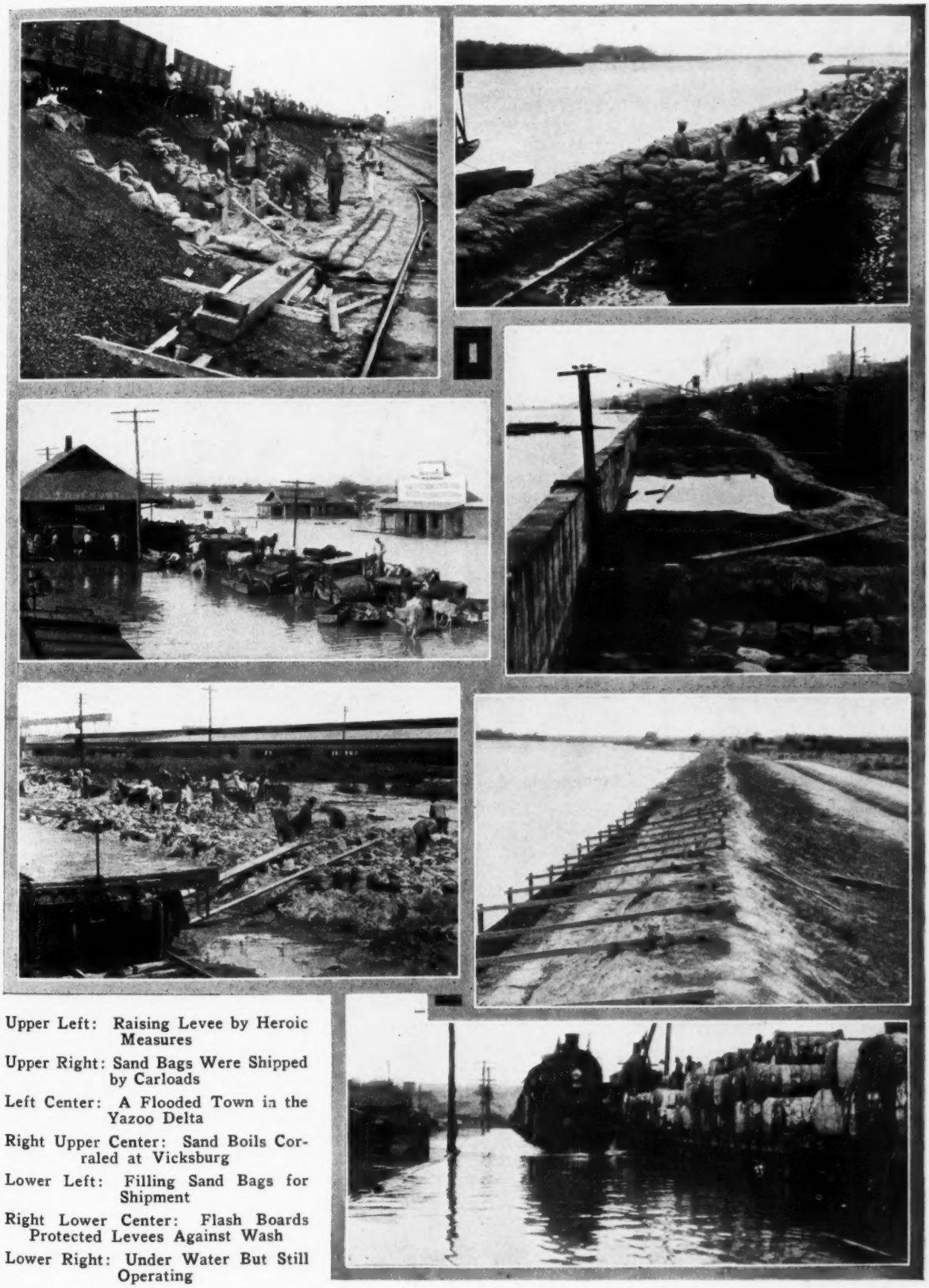
Right Center: Levees Raised with Wheelbarrows

Left Center: Houses Floated Against the Roadbed

Lower Right: Trains Were Run With the Track Under Water

Lower Left: Numerous Stations Were Submerged

River Flood in Photographs



Upper Left: Raising Levee by Heroic Measures

Upper Right: Sand Bags Were Shipped by Carloads

Left Center: A Flooded Town in the Yazoo Delta

Right Upper Center: Sand Boils Coraled at Vicksburg

Lower Left: Filling Sand Bags for Shipment

Right Lower Center: Flash Boards Protected Levees Against Wash

Lower Right: Under Water But Still Operating

S. P. Remodels Roundhouse Exterior in Spanish Style

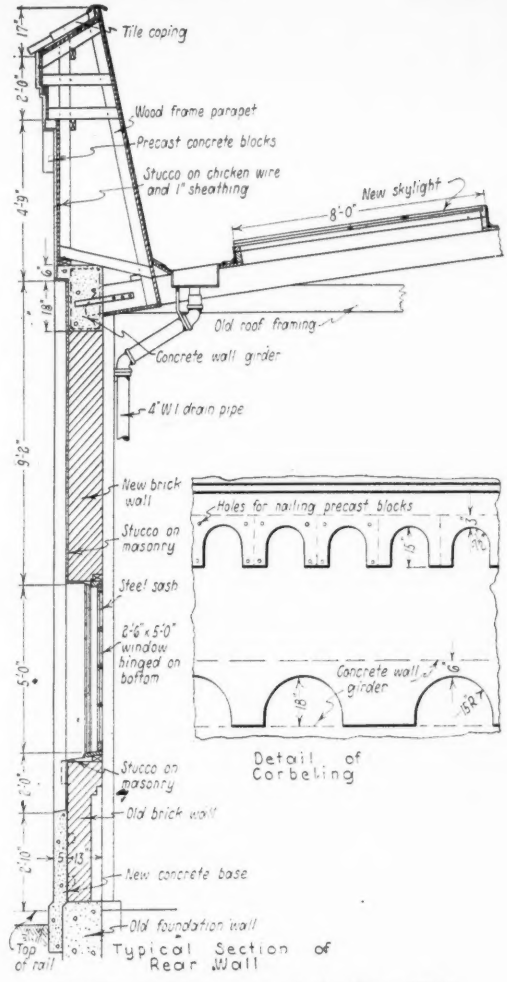
A ROUNDHOUSE as ordinarily constructed does not conform to pleasing architectural lines and hence is usually a jarring note where beauty is desired, as alongside a city boulevard. However, the Southern Pacific now has a roundhouse at Santa Barbara, Cal., which suggests an amphitheatre built in the Spanish style and which represents the railway's principal contribution to the plan carried out by the people of that city in the extensive rebuilding following the earthquake of June, 1925, to secure a harmonious appearance in conformity with the Spanish type of architecture, which is the historical heritage of southern California.

The roundhouse, which was one of the structures to suffer severe damage from the earthquake, was a 10-stall building with wooden frame and brick end and rear walls. It had a typical flat gabled roof, sloping to the front and rear walls with a monitor on the ridge. The rear wall had wooden sash windows in brick arched openings such as were common until the use of large glass areas and steel sash came in vogue. While plans were under way for repairing the damage done to the house, the architectural advisory committee of the city, which was directing the work of restoration along lines that would insure greater harmony and beauty, proposed that the railroad move its engine terminal to another site because it was deemed an eyesore to a projected boulevard which would pass close to the rear of the house. However, when the railway officers pointed to the difficulties in the way of this proposal, the committee suggested that the rebuilding of the house be carried out along lines that would harmonize with the general scheme of architectural treatment as it was then being applied to the reconstruction of buildings throughout the city and the railroad readily complied with this idea, with the result shown in the photograph.

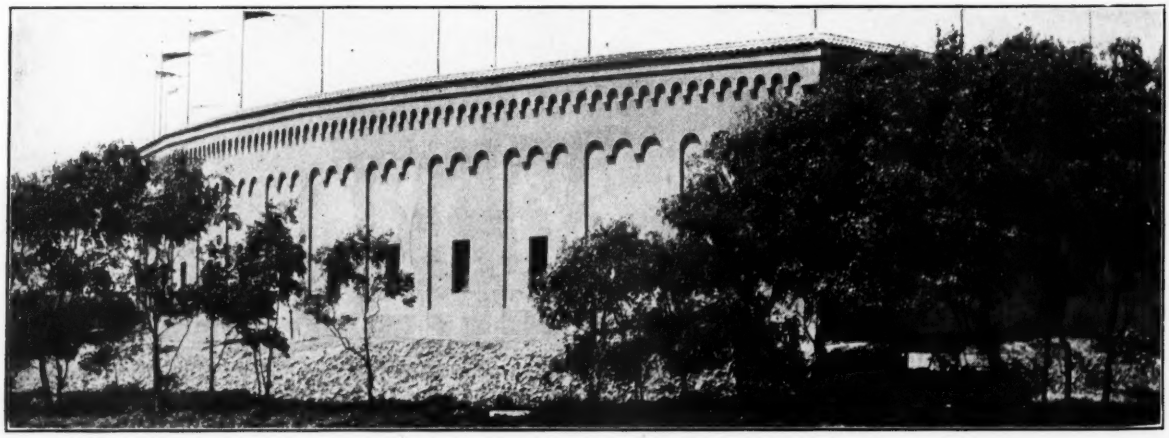
Appearance of Bullfight Arena

The rear and end walls of the roundhouse, instead of conforming to the usual type of construction, give the appearance of a Spanish bullfight arena with large, unbroken areas surmounted by arched corbeling and an arched cornice. By means of a parapet surmounting the wall, the top is carried high enough to conceal the roof monitor from view and the window areas are limited to a single small window in each bay.

The cross section of the house illustrates how this construction was carried out. The wall is of brick to the bottom of the corbeling which is incorporated in a concrete wall girder that receives the ends of the rafters. The parapet above this grider is of frame



Details of Treatment of the Rear Wall



This Is Not a Spanish Amphitheatre, But a Roundhouse

construction and is topped with a tile coping. An application of cement stucco to the entire wall, including the brick work, the concrete girder and the frame parapet, gives the wall a uniform appearance from top to bottom that is decidedly pleasing.

An extra tier of skylights in the roof adjacent to the rear wall compensates for the loss of natural fighting through rear wall windows.

This manifestation of the co-operative spirit on the part of the railroad in the work of restoring the city of Santa Barbara was further attested in carrying out a change in the color scheme of the passenger station in accordance with the desire of the architectural advisory committee.

Floods Curtail Tie Output

PRODUCTION of cross ties will be curtailed somewhat as a result of the floods of the Mississippi river and its tributaries, which have inundated more than 10,000 square miles of territory and have driven more than 180,000 persons from their homes in the worst disaster that section has ever known. This is shown in answers to a questionnaire sent to members of the National Association of Railroad Tie Producers who operate in the stricken sections, and published in the current issue of the Cross Tie Bulletin, the official publication of the association.

It was at first thought that conditions would not be propitious for work on the farms, in which event the labor that would be employed in agricultural pursuits would turn to the task of tie production. However, the questionnaire developed that such will not be the case. According to some of the answers more persons will be required on the farms because the schedule of work is late.

There was a division of opinion as to whether labor will leave the flooded sections to find employment elsewhere. Some producers felt that labor would naturally leave the flooded sections to find employment elsewhere, while others felt they would be needed for work on the farms.

Must Wait Until Roads Are Dry

One producer stated that "tie production will increase somewhat, but not until the roads and woods are dry," but, he added, "it will be some 60 days before operations in the woods can be resumed." Another expressed the opinion that more labor would be available for tie production, but he feared that higher wages in the saw mills and oil fields would attract them from the task of "hacking." Several believed that the labor situation would be normal. Most producers stated that there would be no delay in the hauling of ties because of the water-soaked condition of the roads, but others said there probably would be some delay, while one placed the delay at 60 days and another at 30 days.

The loss of ties in stock on yards as a result of the floods will be small. Most of the answers indicated that there had been no loss from this source. One producer said that he had lost "a considerable number," several said "not many." Another operator reported that "quite a few ties have been scattered that will necessarily entail some expense in getting them back to the yards."

Most operators stated that there was no loss of many fresh cut logs "down" in the woods. One large producer stated that "the flood waters will cause quite a loss of fresh cut logs cut prior to the high water."

What Producers Say

"A lack of seasoned ties this summer and an increase in production about July," was predicted as a result of the floods by one producer. Here are other comments:

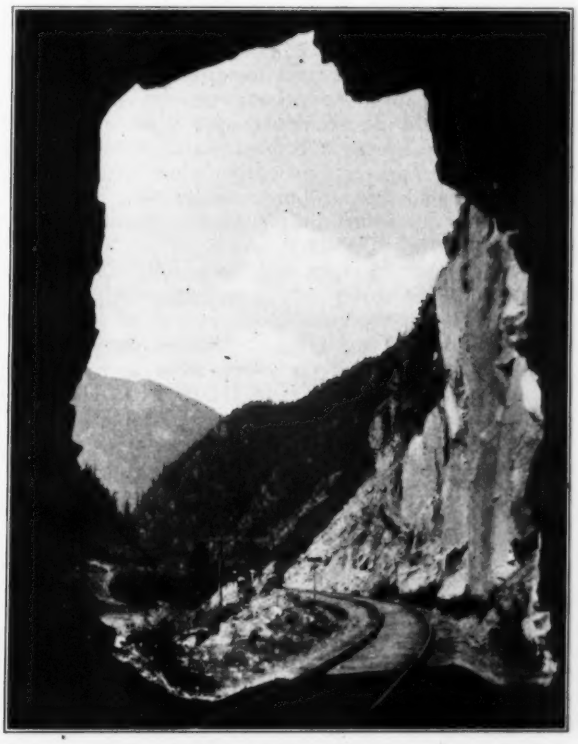
"In some sections where it is too late to put in a crop, undoubtedly greater quantities of ties will be produced during the summer months. However, in those localities production will not be started for at least six weeks. Generally, we are 60 to 90 days behind in our production, and it appears as if we are going to remain at least 60 days behind during the entire year, unless we get an unusually large production in central Arkansas. It will be a number of weeks, however, before we will be able to determine this."

"The floods will increase the demand for ties, as our experience for the last six weeks is that the production has been cut at least in half and stocks of ties on hand are not nearly as large as they were at this time last year."

"In southwestern Missouri, northwest Arkansas, eastern Oklahoma and northern Texas, we believe it will have the general effect of slowing down production until the farmers get caught up with their work."

"It is a rather difficult matter to judge the general effect of the floods on the tie industry until the water has subsided, as I do not believe anyone can estimate the damage until the water subsides."

"The floods will cause lumber prices to advance, thereby lessening production of ties in addition to actual losses caused by the floods and should produce a scarcity of ties, which will more than offset extra production this spring."

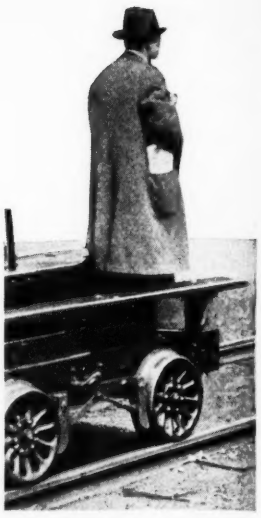


Yale Tunnel on the Canadian National in British Columbia

Talking Safety
To the Men in the Ranks*

The Part the Supervising Officer Should Play in the Campaign for an Improved Accident Record

By GEORGE H. WARFEL
Assistant to General Manager, Union Pacific, Omaha, Neb.



A Supervising

THE relation of the division engineer to safety is fundamental. Being responsible for the largest third of the division personnel, it would follow that at least a third of the personal injuries might be expected from his department. All of the bridges, buildings and permanent structures are under his care, and hazards of fire, flood and property damage affect his record more vitally than is the case with his colleagues on the superintendent's staff. When it is also considered that a large part of the work done by his forces directly involves the safety of train operation, it is apparent that upon him will depend in large measure the safety record of the division, and of the railroad. It is fortunate for that record that safety is the very essence of his craftsmanship and is a cardinal principle in the ethics of his profession.

What will he do to improve the safety record of his road? He will probably consider two major problems: the reduction of train accidents caused by track and bridge conditions, and the reduction of personal injuries to his employees. We shall not attempt to discuss that first major problem, so far as physical conditions enter into it. Volumes have been written about broken rails, which caused 650 derailments, 25 deaths and 397 injuries in 1925. It is comforting to note that the 350 derailments due to bad ties, and 206 more due to spread track, resulted in scarcely any casualties, because these were nearly all on side tracks. But the 21 accidents with 4 killed and 83 injured caused by the failure of maintenance of way employees to protect properly when obstructing track, are decidedly for our consideration. We are most keenly interested in the *human* factor of that first problem.

The division engineer will do much, of his own initiative, but he will do very much more if his superintendent is as vigorous and aggressive in safety work as he should be. On a railroad, inspiration, like criticism, should properly come from above down through the organization, and this is especially true of accident prevention. The standing of a railroad in the I. C. C. accident tabulations is a fairly reliable index of the energy of its management in accident prevention.

Discipline of Great Importance

If our division engineer is properly inspired, he will be one of the strictest disciplinarians on the road. His trackmen must never fail to find the wash-out before the train finds it. His bridge men must never make superficial inspections. His flagmen must be letter perfect in the rules. They must all be so frequently and critically checked that their performance is automatic. He won't merely believe they will do it, he will know they are doing it! The least deviation discovered must be followed by summary discipline advertised all over his division. His immediate subordinates, the supervisors and roadmasters, must be shown that reluctance or indifference in matters of discipline on their part will subject them to the same sort of treatment. This attitude does not necessitate anger, coldness or ill temper on the part of the officer, merely aggressive insistence upon literal rule observance. That is the most reliable preventive for train accidents caused by man failures that has ever been devised up to now. Cordial and friendly relations with employees is a most desirable condition, but it should not exist at the expense of discipline.

There are two ways of determining the occasion for discipline. The long established custom has been to administer punishment after the accident—graduated according to the seriousness of the actual result. The more effective method, from the standpoint of accident prevention, is to administer the discipline before the accident—graduated according to the gravity of the hazard incurred by improper performance.

Our thoughtful engineer immediately perceives that he is handicapped in his constructive effort along this line, because his men are so scattered and isolated. It is rather easy for the mechanical or transportation supervisor to test and check the performance of his men, when they do not realize they are under observation. That is the very best evidence of the effectiveness of instructions—performance when apparently unobserved.

But the difficulty in the maintenance of way department may be partially overcome by vigorous schooling of the supervisor, roadmaster, general foreman and others, to use every opportunity to make surprise checks on performance of the employees. Discipline should be vigorous for infraction discovered because, manifestly, discovery is difficult and would indicate an all too prevalent condition. No division engineer has yet exhausted the means at his command to reduce his casualty ratio, if he has not made full use of that great lever, "Discipline."

Department Has a Poor Record

The greatest opportunity for the division engineer to improve safety performance lies in the reduction of fatalities and serious injuries to his employees. Let us consider the problem of the national division engineer as illustrated by I. C. C. Bulletin No. 94, reflect-

*Abstract from a paper presented before the seventh annual convention of the Safety Section of the American Railway Association which was held at Chicago on April 19-21.

Officer Can Drive Home the Necessity for Care

ing conditions for 1925—the last figures available. In that year this national division engineer's men worked over 972 million hours, more than one-fifth of all the hours worked on the nation's railroads, including the time of presidents, clerks and office boys. In other words, he averaged four hundred thousand men on the job for eight hours each regular working day except two.

Over half those hours were worked by section laborers. Their fatal injury rate (per million man-hours) while on duty was 0.43. The average for all employees was 0.33. What a great field for improvement,—and there are more of the section hands than of any other class of men on the railroads of the country. But the track foreman's fatality rate, 0.44, is worse than the laborers. That difference might be hard for some people to explain, but I am sure my opinion is the correct one. The track foreman is like the captain of a boat. He won't leave the motor car, or the track, till everyone else is off!

These track men furnish cause for serious concern, but there is another group of the division engineer's men, not nearly so large, whose fatality and serious injury rates are entirely too high,—the bridge and building carpenters. Compare their fatality rate of 0.57 with the average of 0.33. Their serious injury rate is 43.28 which the average is 25.77. No wonder it has been proposed to stretch nets under a bridge or building where they are working, like the circus does for its trapeze performers!

But not all of them are hurt by falling. I have heard of one who had let a bridge deck down on to new stringers, but it lacked a couple of inches of resting flat, because one stringer was not quite in place. So he stood on a stringer, with one foot under the ties of the deck, and with a bar he pried the other stringer into place, letting the whole bridge drop on his toe.

What Can He Do About It?

Now the important question is, "What to do?"

First of all, the superintendent must back him up, when he insists upon the management providing first class tools—tools proven by field test and laboratory analysis to be the best. But even the best tools get worn and dull, and we must have good repair shops, manned by men who know the service these tools must stand, and how to condition them properly. It is foolish to let a four-dollar imitation blacksmith ruin 50 modern track chisels, which costs $75, in one day, by not knowing how to handle heat treated steel.

With improvements in equipment, the accidents caused by poor equipment become fewer, and the rule violations are less, but there continue to be a lot of accidents that indicate that the man in the field gets hurt apparently from his own indifference. So the division engineer analyzes the situation like this: "These section laborers, and foremen, and bridge carpenters, and singal men, are scattered all along the hundreds of miles of line. They don't often get into safety meetings. I can't afford to bunch them up every month as the master mechanic does his men, or the trainmaster does his. How can I get at them? I can mail thousands of circulars and letters out to them each week or so, telling them what has happened elsewhere, what new methods are being tried, and perhaps get a little enthusiasm stirred up. But by that method I don't get any information from them. They don't take any part in helping solve our accident prevention troubles. And lots of them just feel that these letters are for the other fellow. I don't get the personal contact.

"Well, there's another way I can reach them, if I must. I could divide this division into two or three parts, and make a trip over one part each month on the motor car with the safety agent, and hold a half hour safety meeting with each gang and not only talk to them, but make them talk, too. That method would reach the most isolated, the most numerous, and most hazardous classes in my force. But even then we can only talk to them once in two or three months, and there's so much to tell 'em, we couldn't say half of it in half an hour. The circulars would do that better."

So he confides his thoughts to the safety agent. But that fellow says—"I hate all day motor car rides as much as you do. It would take a three to five-day trip each month, maybe a week, to do it right. But it is one sure way to get that personal contact. Copy and mail the circulars and letters, too. Then we won't have so much to repeat over and over.

"But why let the superintendent sit in his office or private car while we preach safety? I'm going to tell the general manager that if he'll make the superintendent go, too, with the bridge supervisor, and the roadmaster and us, we will just organize this gospel team and convert the whole force."

The general manager will say, "Sure, a three or four or five-day motor car trip each month will do each superintendent as much good as it will the safety work. He will see more and know more of the work and of the men. Good idea! We'll do it!"

What to Tell Them?

A few nights before our party starts out, our friend gets to thinking—"Well, we're going out to tell 'em. What?" Telling men to be careful is not enough these days. What are some specific things he can say? Here are a few he thought of:

No ties, timbers, rails or similar material will be handled unless the foreman or an examined assistant is present, and actively supervising the actual handling.

Tie tongs must be used, instead of picks or shovels, for moving ties around.

Luggers or carrying hooks must be used in carrying timbers.

Rail tongs must be used in carrying rail.

Undue haste or excitement must not be tolerated around rail loaders, cranes, derricks or work trains.

The clawbar is the most dangerous individual tool used on track. It must be kept in first class condition and used very carefully.

Every spike must be well started into the tie before being struck a full blow.

Mauls or sledges with side worn faces or showing any signs of cracking or flaking must not be used.

Track chisels or punches with battered or mushroomed heads must not be used until dressed flush on the tool grinder.

Chisels must have smooth, evenly dressed cutting edges and must not be used if nicked or chipped.

Sledges, not mauls, must be used for striking chisels or clawbars.

Wrenches must have straight, square, close-fitting jaws.

Every defective tool which would endanger men must be tagged with a red linen tag bearing the words, "Unsafe to Use." No man may remove that tag except the man who repairs the tool, under penalty of dismissal.

Men must wear goggles provided by the company when cutting rail, bolts, nuts, plates, or bars, or chipping concrete, brick or other hard material, or at any other eye-dangerous work.

When tapping down spikes, cutting off bolts or similar work, men must be spaced not less than two rail lengths apart.

On rail renewal jobs, all cutting and stripping of old rail must be done by oxy-acteylene torches.

Thin-soled or soft-soled or soft-toed shoes must not be worn.

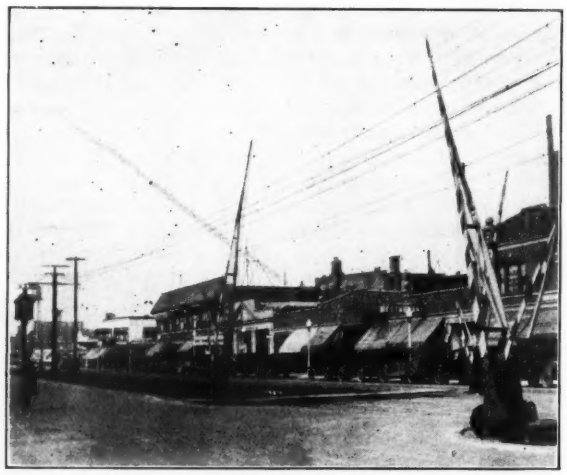
Slipping, stumbling and falling produce more accidents than any other general cause. Men who are awkward, clumsy, careless or heedless in moving about will not be retained in service.

The handling and running of track cars results in many accidents and casualties. Men must be taught that they are in the gravest danger of injury while handling or riding on them. Each man's entire attention should be given to safety while so doing. Our men should be as carefully trained and drilled as fire department men in their conduct around track cars. Each should ride in a specified place and have certain duties. The same idea applies to the inspection and care of the car, the loading of tools, the care of lanterns, and many other duties. It is all summed up in the word, "Training."

Power Gates Permit Multiple Operation

By G. I. WRIGHT
Assistant Electrical Engineer, Chicago Terminal Improvements, Illinois Central

MARKED economies in grade crossing protection have been secured by the Illinois Central through the installation of power-operated gates at 39 crossings in the South Chicago and Blue Island districts of its Chicago terminal where suburban trains operate in large part through city streets. Power operation has made possible the control of gates at several crossings by one watchman. Under the present method of operation 57 crossing gate watchmen are needed for 24 hours a day whereas 111 watchmen would be required if the same amount of protection were to be secured under the old method of hand operation with a watchman at each crossing.



Power Operation Has Made It Possible for One Watchman to Control the Gates at Several Crossings

As a part of its electrification program in Chicago, this road, about four years ago, rearranged its tracks running through the streets in this section of the city. After electrification more trains were added, which, due to their quiet, high-speed operation and the greatly increased automobile traffic, made street crossing protection a difficult problem. Diaphragm pneumatic gates operated by hand pumps located in watchmen's cabins on the ground were in service at several of the street crossings and at the time the track arrangements were made it was decided to protect all street crossings and to have one gateman control not only the crossing at which he was located but also the crossing a block away in each direction. This section of the city has grown very rapidly and the streets on which the Illinois Central operates have been paved on each side of the tracks.

To obtain a good view of the distant crossings the men have been placed in elevated towers located between the tracks and a motor-operated air blower has been installed in each tower for the operation of both the old and new gates. This scheme of operation was developed by the railroad, using apparatus manufactured by the Buda Company of Harvey, Ill. It has proved very successful, due to the low cost of operation and maintenance and the ease and reliability of operation. In addition, the first cost of gates of this type is less than of electrically-operated gates.

The air blower set, which is located in the towerman's cabin, comprises an induction motor driving a small, low-pressure air blower, which exhausts air at any pressure desired up to 14 lb. The air is fed to the gates through four-way cocks, allowing the operator to admit air to one side of the diaphragms or cylinders and exhaust it from the others. Thus the operator has complete control over the motion of the gates, being able to stop them in any position. Three

sets of four gates are operated from one tower and one blower, the latter only being operated while the gates are used, or while a train is passing. A simple push-button type of motor controller governs the starting and stopping of the air unit. In this way practically all of the air is utilized for actual work, the energy consumption being only 17 watt-hours for the raising and lowering of four gates. Means are provided for varying the air pressure to take care of different conditions, such as wet and heavy gates, strong winds, different weights of gate arms, etc. When first installed the blowers were found to make a puffing noise, which was considered objectionable due to the installations being in a residence neighborhood, but this has since been eliminated by the installation of special intake mufflers. The I. C. has operated 14 of these power blowers at gate-protected crossings for 4 years and 3 have been in operation for 3 years, all of them operating every day in the year. To date the expense of all repairs to the air units has been less than $25 and the total repairs to the 17 motors, including control equipment, has amounted to less than $25. These expenses are all that have been necessary in addition to a periodic oiling, which item averages 38 cents per generator and 38 cents per motor per year.

The motor-operated blower may be installed wherever electric current is available, either for a new installation or to replace present hand-operated air gates of any type or manufacture. The gates can be several hundred feet from the tower controlling them and the installation may include any number of gates which the operator can control effectively. No air storage tanks, no reducting valves, and no automatic governor on the motor are required. The units may be installed in a regulation watchman's cabin, or in a suitable housing at the base of a gate tower, as a space about 18 in. by 18 in. by 4 ft. is all that the equipment requires.

Standard Condition Rule Controls Tie Renewals

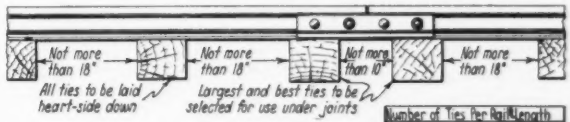
HOW TO make certain that the standard tie condition on each mile of track of a given class of line shall be as nearly uniform as possible on all parts of the property is one of the problems which confronts the system maintenance officer. It is to this end that supervisors are required to check the ties marked by the section foremen for renewal and that inspections are made by system officers.

A further measure to obtain uniformity in tie renewals has been applied in recent years on the Wabash, in the form of rules for tie condition which help the foreman to judge for himself what is expected. These rules, as printed on a standard sheet of instructions for tie renewals which cover also tie spacing, method of handling, etc., are as follows:

"Each panel of 20 ties should have at least 12 good gage ties, 5 with good bearing and 3 doubtful ties, uniformly distributed. Under no circumstances should there be less than 9 good gage ties, 6 good bearing ties and 5 doubtful ties uniformly distributed in each panel of 20 ties."

A preliminary estimate of tie renewals for the following year is made by track foremen and supervisors during the month of June. This is followed up by a detailed inspection by tracks and miles during the month of October. Early in the spring and before any renewals are made each tie to be replaced is marked by the track foreman and this inspection is checked by the supervisor. The division engineer checks various representative miles on his territory to insure conformity to standard practice.

Most of the cross ties are delivered during the fall and winter months, and stored on station grounds. Final distribution is made by work train a short time in advance of beginning renewals. All renewals



All ties should be placed with the heart face down, square to the line of the rail. The largest and best ties should be selected for use at joints, and the joint ties shall be spaced so as to have not more than 10 in. between bearing surfaces. Intermediate ties shall be evenly spaced, and in main and running tracks the distance between the edges of two adjoining ties should not in any case be greater than 18 in. Ties should be kept properly spaced, and particular attention given to the joint ties to insure their not becoming slewed to the line of the rail. Tie tongs should always be used in the handling of ties. The number of ties per rail length shall be in accordance with the table, with a proportionate number of ties for short rails.

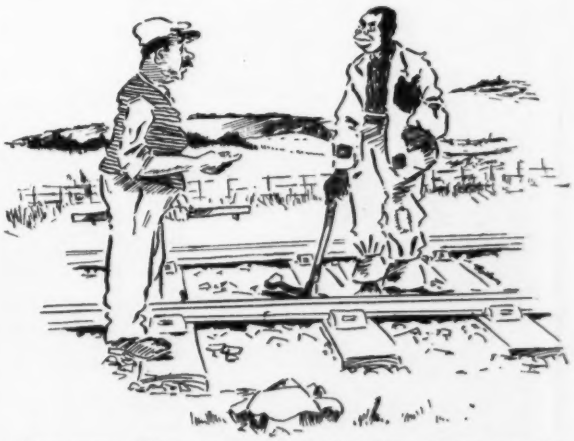
Each panel of 20 ties should have at least 12 good gage ties, 5 with good bearing, and 3 doubtful ties, uniformly distributed. Under no circumstances should there be less than 9 good gage ties, 6 good bearing ties and 5 doubtful ties uniformly distributed in each panel of 20 ties.

Number of Ties per Rail Length			
Class of track	36 R	33 R	30 R
Main line - main track	24	20	18
Sidings & passing tracks	22	18	16
Branch lines - main track	22	18	16
Sidings & passing tracks	20	16	14
Yards & terminals			
Heavy duty tracks	22	18	16
Light duty tracks	20	16	14

Reproduction of the Standard Instructions for Tie Renewals

except those in connection with ballast renewals are made by regular section gangs. A certain number of ties is allotted to each gang for renewal each month during the season, the renewals being made in conjunction with other track work.

At the close of each day's work the track is lined and dressed, and all old ties are piled for burning. Treated ties are used in all renewals, and each tie is marked with a dating nail when placed in track. A weekly report is made by the division engineer, which reflects the status of the renewals, the ties on hand and the "per cent complete" by sections. A record of yearly renewals by miles is also maintained as a permanent record.



Foreman: Have you noticed that Sam tamps two ties to your one?

Rastus: Yes, Ah have, but 'tain't mah fault. Ah done spoke to him about it.

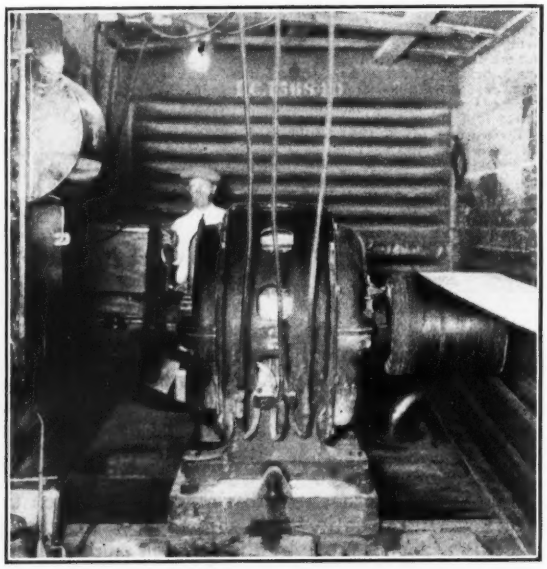
—Adapted from the South African Railways Magazine.

Large Pumping Plant on Wheels of Great Service in Flood

Illinois Central Outfit Unwaters Yard at Mounds, Ill., and Helps To Keep River Out of Vicksburg

By C. R. KNOWLES
Superintendent of Water Service, Illinois Central, Chicago

THE largest pumping plant ever placed on wheels is a unique development which grew out of the efforts made by the Illinois Central in meeting the emergencies created by the present unprecedented flood of the Mississippi river and its tributaries. This plant is being used with marked effect, both in fighting the flood at its height and in unwatering inundated property of the railroad after the crest had receded.



Interior of Pump Car Showing 200 Hp. Motor, Master Switch and Compensator

The portable emergency pumping plant consists of one 18-in., one 12-in., and one 10-in. pump, all electrically-driven. The complete station is mounted in three cars, exclusive of a fourth car which is used for transporting the necessary pipe and pipe connections. The 18-in. pump is installed in a 40-ft. automobile type box car with a steel underframe, this type of construction being necessary in order to make the installation as rigid as possible and to prevent the motor and pump from getting out of line. The two smaller pumps are placed in another box car of similar design, while the transformers for stepping down 2,300-volt primary current to 440-volt current for use on the motors are located in a third car. The combined pumping capacity of the three pumps is from 17,000 to 20,000 gal. per min., the pumping capacity varying with the head under which the pumps are operating.

Use Centrifugal Pumps

The 18-in. pump is a low-pressure, single-stage belt-driven, side-suction centrifugal pump, driven by a 200-h.p. 440-volt, 60-cycle, 3-phase, constant-speed induction motor. The motor is located in one end of the car and the pump in the other end and the power was transmitted from pump to motor by a 16-in., 6-ply rubber belt. This arrangement permits 21-ft. belt centers, thus minimizing belt slippage. The drive pulley on the motor is 18 in. in diameter and

Mounds, Ill., Yard Before the Pumps Were Started

the pulley on the pump 32 in. The speed of the motor is 600 r.p.m. at full load, making the speed of the pump approximately 330 r.p.m., the delivery at this speed being 10,000 gal. per min. against a 30-ft. head.

Spiral riveted flanged pipe 18 in. in diameter is used for both suction and discharge. The suction line is passed through an opening in the side of the car and consists of 15 ft. of pipe with one 90-deg. bend and a 20-in. foot valve. The discharge is carried at an angle from the pump to the side door of the car where it is provided with a 45-deg. bend to bring the pipe at right angles to the car.

A 1½-in. centrifugal pump connected directly to a 5-hp. 440-volt motor is provided for priming the large pump. The time required for priming with the suction pipe empty is from five to six minutes. The 440-volt current is carried from the transformer car through a lead-sheathed cable to a master switch and from the switch to a 200-hp. starting compensator controlling the operation of the motor.

The 10-in. and 12-in. Pumps

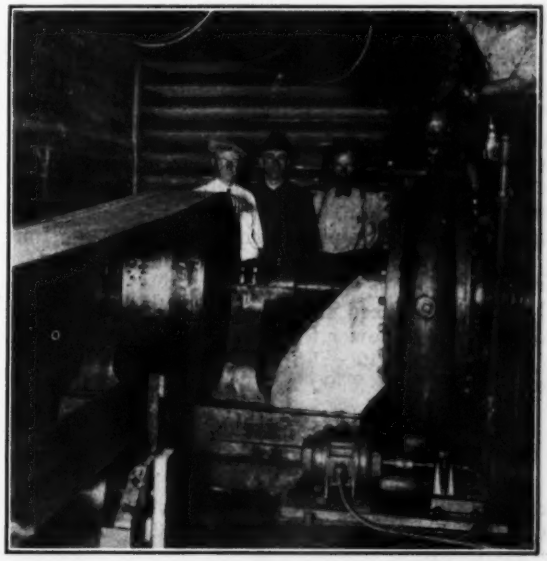
The two smaller pumps are both low-pressure, single-stage, belt-driven, side-suction centrifugal pumps, and both pumps were placed in the center of a second box car, the suction and discharge lines extending through the side doors. They are driven by 75-hp. motors located at opposite ends of the car by means of 10-in. belts. The motor driving the 12-in. pump is a 440-volt machine supplied with current from the transformer car through weatherproof cable and is controlled by an a-c. rheostatic controller and three resistance grid units. The motor driving the 10-in. pump is a 2,300-volt motor supplied with current direct from the primary line and is controlled by an auto starter.

No foot valves are provided with the 10-in. and 12-in. pumps and they are primed by exhausting the air from the pump and suction pipe by means of a 2-in. blower, also electrically-driven. Both suction and discharge lines were made as short as possible, only one bend being used on each suction and discharge, the length of the suction lines being 12 ft., while the discharge from both pumps empties into flumes formed of 18-in. pipe. The combined capacity of the 10-in. and 12-in. pumps is approximately 7,000 gal. per min. All cars are lighted by four 110-volt electric lights, connected in series for operation on a 440-volt circuit, separate switches being provided for the priming pumps and the lights.

Yard at Mounds, Ill., Was Flooded

The idea of the portable pumping plant had its inception in the problem of unwatering the Illinois Central's yard at Mounds, Ill., which was flooded by the breaking of levees on April 17. The Mounds yard and shops are located seven miles north of Cairo, Ill., in the low, narrow peninsula just above the confluence of the Ohio and Mississippi rivers. It serves as a gateway for northbound and southbound traffic and at the time of maximum stage in these two streams was handling an exceptionally heavy traffic of Kentucky coal, strawberries, bananas and vegetables, as well as the trains of another railroad which were being detoured over the Illinois Central.

On April 17 the breaking of levees built to keep



Interior of Car Showing 18-In. Pump, Priming Pump and Suction and Discharge Connection

Twelve-Inch Pump Discharging Over Seawall at Vicksburg. Y. & M. V. Station in Background

back the waters of the Mississippi river on the west and the Ohio and Cache rivers on the south, resulted in flooding the yard and while this did not cause the entire suspension of operations it was imperative that the yard be restored to complete effectiveness as soon as possible after a lowering of the river stage would make it possible to drain the yard. While a large part of the water would have drained away from the yard as the water receded in the rivers, there was a certain amount that would not drain away naturally but would have had to be pumped out in any event, as it is necessary to maintain a small pump in the lower end of the yard to take care of the rainfall over a portion of the yard.

It was decided, therefore, to undertake the construction of a portable pumping plant which could be used for this purpose. The first requirement was to find out where pumps and motors of ample capacity could be obtained on short notice, and a search resulted in the purchase of the 18-in. pump from Joseph E. Nelson & Sons, contractors, at Chicago, whose men installed the pump, together with a motor borrowed from the Illinois Power & Light Corporation, in the car at Chicago and completed all wiring and piping before the car was moved to Mounds.

The 10-in. and 12-in. pumps were borrowed from the Cairo Water Company and were installed and outfitted at Cairo, together with two other motors procured from the Illinois Power & Light Corporation. The three 100-kva transformers, having an available capacity of approximately 600 hp., were fully wired and equipped for both primary current and lead wires to motors.

It will be realized that it was no simple task to provide electric power for these units, requiring 350 hp. in the aggregate. Fortunately ample power was available from the 2,300-volt line of the Central Illinois Public Service Company at Mounds, and all wiring to the transformer car was done by the public service company. An interesting feature of the electrical installation at Mounds was the stringing of the 2,300-volt cable across a string of box cars, as the pumping station at this point was placed on tracks that were under four feet of water and was accessible only by boat. The use of the large pumps expedited the restoration of the yard to normal operation by about 48 hours, the amount of water handled by the pumps at Mounds being approximately 50,000,000 gal.

Pumps Rushed to Vicksburg

By the time that the crest of the flood had passed Mounds and Cairo the Mississippi river had reached such a high stage at Vicksburg that the seven permanent sewage pumps and 20 emergency pumps in service back of a sea-wall at that place could not handle the water that was coming in under the wall, from sand boils and abandoned sewers, to say nothing of the storm water from rains, all of which had to be pumped over the wall into the river. The pumps were rushed to Vicksburg and placed in service. As an illustration of the value of mobile pumping units of this type the outfit left Mounds at 7:30 p.m. Friday and was pumping at Vicksburg, 430 miles south of Mounds, at 7:30 p.m. Sunday, 48 hours later.

In addition to these three large pumping units brought from Mounds, 20 smaller temporary pumps were in operation at Vicksburg, 13 of which were steam pumps, mounted on flat cars so that they could be moved from place to place as necessity required. These pumps were operated by steam from locomotives. The combined pumping capacity of all pumps installed and operated by the Illinois Central at Vicksburg was 48,240,000 gal. per day or sufficient to supply a city of 1,000,000 population.

At first thought the importance of keeping the water from flooding the territory behind the sea wall at Vicksburg may not be apparent to one not familiar with local conditions. While the residential and retail districts of Vicksburg are located on the hills well above the highest water, the wholesale and manufacturing districts as well as the railroad shops, yards and passenger facilities, are located at the base of the hills, immediately behind the sea-wall and levees where the ground level is far below flood stage in the river. In the event that the water had been permitted to flood this territory it would have completely paralyzed the wholesale and industrial portion of the city and caused a heavy financial loss through damage to property and stocks of goods, in addition to making it extremely difficult if not impossible for the many boats engaged in rescue and flood relief work to land at Vicksburg, for with the crest of the river at a stage of 58.7 ft. or 3.7 ft. higher than any previous record, this territory would have been covered with water to a depth of from 5 to 25 ft. It is estimated that the pumps installed at Vicksburg by the railway company alone handled a total of 400,000,000 gal. of water during the high stage of the river.

The large mobile pumping units have proved so efficient and satisfactory that the 18-in. pump will be installed permanently in a car and will be equipped both for steam and electric drive.

Motor Car With Saw Attachment

MOTOR CAR Repairman B. J. McAboy of the Springfield division of the Illinois Central has recently constructed a combination motor car with a saw attachment for use by carpenter gangs. The outfit consists of a 4 hp. Fairmont engine mounted on a standard motor car frame, with 16-in. wheels instead of the standard 20-in. wheels. The

Ripping a Board With the Saw

saw table, which can be removed by taking out four bolts, thereby converting the machine into a standard motor car, is made of a 1½-in. angle iron frame with a hinged oak top and the saw is a 10-in. circular rip saw with a 1-in. mandrel 24 in. in length. The saw is completely covered at all times and the car is

equipped with a sturdy pipe railing which can be used as a rest for long pieces of lumber when the saw is in use. The saw frame is welded, thus affording no opportunity for the saw to get out of line by reason of the frame becoming loose. The blade is thoroughly shielded as a safety measure and the table is so arranged that the car can be operated without removing it, while the seating capacity of five men is maintained. The conversion of the car into a saw outfit is made readily by an exchange of belts, which is accomplished by removing a pin in the belt lacing.

The engine used in this machine was purchased at the time the Illinois Central took over all of the privately-owned motor cars on its road. The cost of overhauling the engine and fitting up the combination car was as follows:

Labor, overhauling engine and frame	$34.12
Material, overhauling engine and frame	36.08
Labor, building saw table and attachments	11.68
Material, building saw table and attachments	6.52
Total cost of machine	$88.40

This machine is assigned to the division carpenter gang for use in conveying men and material to the job and for sawing lumber used in the work. The saw can be operated at a cost of 50 cents per eight-hour day and it is said to do the work of four men. The efficiency of the car was demonstrated recently when six men and a trailer loaded with 500 bricks were carried a distance of one mile, while a straight run of 20 miles failed to show any signs of overwork. Sawing tests were made satisfactorily, using 2-in. thoroughly seasoned oak and 2-in. water-soaked lumber.

D. T. & I. Adopts Concrete Fence Posts as Standard

IN CONNECTION with the electrification of a part of the Detroit, Toledo & Ironton, reinforced concrete arches to carry the trolley wires were manufactured at a concrete products plant at Fordson, Mich. More recently the railroad has undertaken further use of this concrete plant for the manufacture of concrete fence posts of a type embodying some new elements of design and these posts have been adopted as standard on the lines of the railroad. They are being used in fencing the right-of-way of the Durban-Malinta cut-off as well as for practically all renewals of fence posts on existing lines. The distinctive feature of this fence post construction is the use of a concrete brace member having a T-shape to develop greater earth reaction in the buried portion as well as the use of a special form of joint for fastening the brace to the corner post.

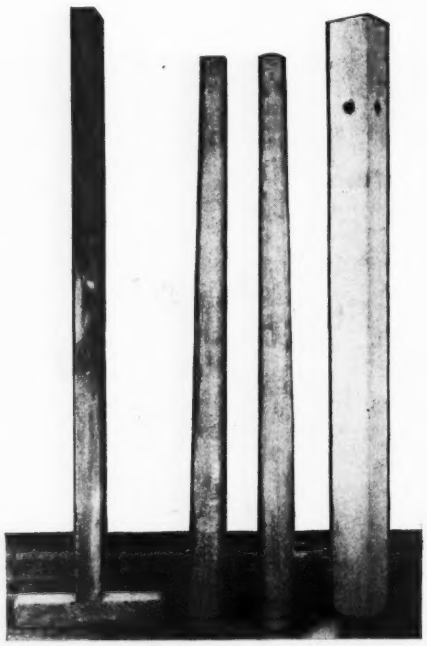
The line posts are of the typical closed-U section, with the flat side next to the wire. They are 7½ ft. long, 5½ in. by 5½ in. in section at the bottom and taper to a top cross section of 3½ in. by 3½ in. The gate or corner posts are square in section, 7 in. by 7 in. by 8 ft. long, while the braces are also square in section, 4 in. by 4 in. by 8 ft. long, with a cross piece of the same cross section at the bottom 2 ft. long, giving the brace the form of an inverted "T." All of the posts, as well as the braces, are reinforced

Standard Gate Construction on the D. T. & I. In the Circle—A Corner Post with Braces

with four deformed bars, one in each corner, those in the line posts being braced by means of three sheet metal crosses punched to be threaded over the bars. The braces and corner posts are held in position by short pieces of bar, electrically welded to the longitudinal bars to produce a rigid steel frame.

In both the corner and line posts no provision is made for any special fastening of the fencing wire to the post, which is attached by tie wires passing around the back of the post and wrapped tightly to the longitudinal fence wires on each side. The taper of the line post is enough to keep the tie wires from slipping down.

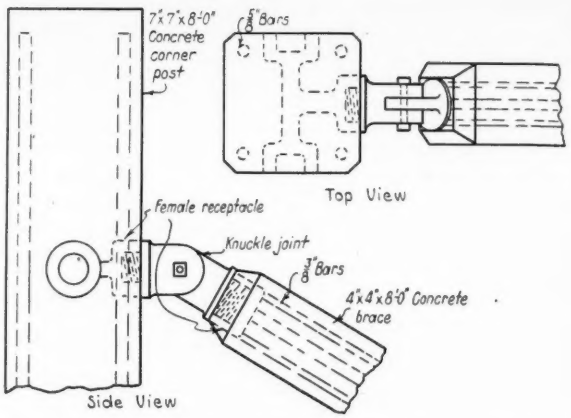
The connection of the brace to the corner post is an improvement over a type previously used and has its chief advantage in that it permits the placing of the brace at any angle desired. In fact, it provides what is virtually a universal joint. Near the top, cast in the body of the post itself, are female threaded receptacles for the attachment of the brace. These receptacles are at right angles to each other, being part of a single casting, as illustrated in the accompanying diagram. Cast also in the top end of the braces are female threaded receptacles similar to those cast in the corner posts. The braces are attached to the corner posts by means of galvanized iron knuckles with male threaded fittings. The knuckle joint allows the corner post to be placed at any angle, such as on curves, or at right angles on square corners or at gate openings. Either one, two or three braces may be used. The standard corner post is also used as a gatepost by adding U-bolt



The Line and Corner Posts and the Brace Member

fittings which carry the gate hinges on one end of the gate and the gate latch on the other end. Only metal gates are used.

The use of concrete fence posts was undertaken on the D. T. & I. as an experiment in the fall of 1924 and the results secured were so favorable that the manufacture of these posts was undertaken in 1925 on an extensive scale at the concrete plant at



How the Braces Are Attached to the Corner Posts

Fordson. As a result, by the end of 1926, 16,287 concrete line posts, 2,008 braces and 982 corner posts had been made.

The Responsibilities of a Section Foreman*

By George Long
Section Foreman, St. Louis Southwestern, Bell City, Mo.

1. To maintain the track under his charge properly means that it be kept in first class condition or as nearly so as possible.

2. To use material economically.

3. To see that all tools are in good condition, for defective tools sometimes cause personal injury.

4. To see that public highway crossings are in good condition; good crossings prevent accidents.

5. To patrol his track after severe wind or rain storms, day or night, and report conditions to the dispatcher.

6. To see that no fire hazards exist in or around company buildings or structures.

7. To assist linemen when necessary and make temporary repairs to wires in advance of the linemen.

8. To prevent any encroachment on the company's right-of-way by the public.

9. To see that all tools and materials, both serviceable and scrap, are properly accounted for and properly handled on the material book. To keep all time correct in an intelligent way and as legible as possible.

10. To pay particular attention to the motor or other cars and see that they are in good condition. To see that all tools, material and men are properly placed on the cars, to avoid accident. To have cars equipped with proper flagging equipment at all times.

11. To keep the right-of-way as clean as possible of rubbish and to pay particular attention to grounds around stations and section houses, keeping them neat and clean at all times.

12. To treat the public with courtesy, and by so doing, gain some business for the company. The section foreman can as easily be an asset to the company as a liability.

*A paper presented at the sixth annual meeting of the Maintenance of Way and Sanitary Engineering departments of the St. Louis Southwestern at Paragould, Ark., on March 24, 1927.

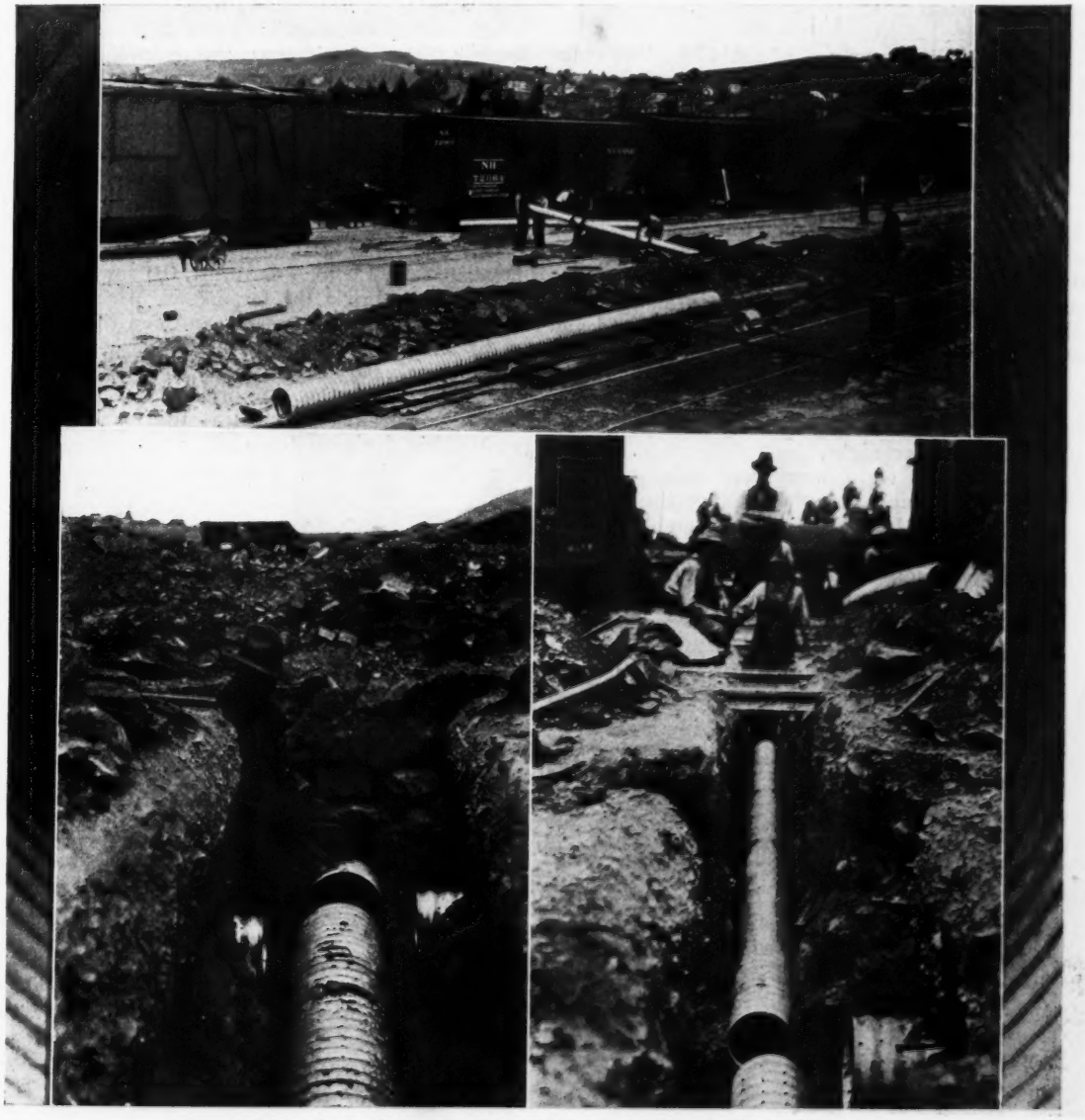
Water Pockets in Yard Drained by Perforated Pipe

Unsatisfactory Conditions in the Bayshore Yard of the Southern Pacific Were Entirely Overcome

CORRUGATED iron pipe with perforations was used to solve a drainage problem in the Bayshore terminal of the Southern Pacific six miles south of San Francisco. The car repair yard of this terminal, 900 ft. long by 300 ft. wide, had given trouble during rainy seasons because of soft foundations and the varying nature of the filling materials used in its construction. Owing to settlement, the yard had to be raised repeatedly, and because the original filling was of an impervious character and waste rock had been used for subsequent filling, water pockets had been formed which aggravated the tendency to settlement. In addition, lack of effective drainage caused water to stand on the surface to an extent that interfered with the car repair work.

To remedy this condition it was decided to restore the surface of the yard to the established grade and to provide a combined surface and subsoil drainage system. In other words, it was proposed to lay a system of drain pipes which would not only serve to carry away the surface water collected at catch basins, but would also absorb water from the soil surrounding the pipe.

Based on the reports of installations in other yards, a study was made of the adaptability of corrugated culvert pipe with perforations in the valleys of the



At the Top—Part of the Bayshore Yard While Work Was in Progress

The Junction of the Main Drain with a Lateral

Excavating the Trenches in the Rock Fill

corrugations and with a knowledge of the service rendered by corrugated pipe in culverts on the Southern Pacific over a considerable period of years, it was decided to use Armco pipe supplied by the California Corrugated Culvert Company.

The plan for the drainage system was to provide a grid comprising five lateral drains of 8-in. pipe laid crosswise of the yard about 180 ft. apart, these laterals draining into a 12-in. line laid lengthwise along the center line of the yard. The main 12-in. drain, which is 874 ft. in length, empties into a 6-ft. concrete storm sewer discharging into the bay. The 8-in. laterals total 1,560 ft. in length and connect with the 12-in. main by means of concrete junction boxes which serve as manholes for cleaning and catch basins for collecting surface water. In addition to these five junction boxes on the 12-in. line, there are 27 other catch basins on the 8-in. laterals. The lengths of pipe were joined together by means of the usual type of corrugated band coupling.

Laterals Laid Close to Surface

The upper ends of the 8-in. laterals were laid between the track ties at only a slight depth below the base of rail. The lower end of the 12-in. line empties into the 6-ft. concrete storm sewer at a depth of 6 ft. 9 in. below the ground level, making an average grade of 0.2 per cent for the entire system. On account of the successive raising of the yard on waste rock it was not necessary to haul in pervious backfill material to insure percolation into the drains.

The ditching for these drains was done by hand. The pipe was unloaded at a convenient place about 500 ft. from the upper end of the drainage system, and, as it was easy to handle, two men loaded it on push cars in the 20 and 27 ft. lengths employed and conveyed it to where it was to be laid. There was no interference with normal use of the tracks during the installation. In order to prevent injury to the men working and switching in the yard, no trenches were left open over night.

A foreman and eight men were able to install about 100 ft. of pipe a day, including the opening of the trench, the laying of the pipe and the backfilling. All work was done by maintenance of way forces under the direct supervision of E. C. Morrison, division engineer of the Southern Pacific.

A Rock Cut on the Black Butte Line of the Southern Pacific in Northern California.

An Opportunity for Economy in Brick Roadway Pavements

OPPORTUNITY for effecting considerable economy in the construction of brick pavements for teamways and drives around stations, etc., appears to be possible as the result of the tests of brick pavement conducted by the Bureau of Public Roads at Arlington, Va. These tests were carried out on a circular test track about one-tenth of a mile in circumference which was laid with sections of 2 in., 2½ in., 3 in., 3½ in. and 4 in. thicknesses of brick on sand and cement-sand bedding on a concrete base. The bricks were all obtained from one manufacturer and are of the vertical fibre, plain wire-cut, lugless type, 8½ in. long and 4 in. wide, the depths for the several sections being as stated above.

The traffic in the test consisted of 3, 5, and 7½-ton trucks with solid rubber tires, run to a total of 62,000 trips, starting with the lightest truck which was run 10,000 trips, followed by 10,000 trips with the 5-ton truck and 20,000 trips with the 7½-ton truck. Following this, non-skid chains were applied to the rear wheels and the 3-ton and 5-ton trucks were run 10,000 miles in turn, following which the 7½-ton truck was run 2,200 miles.

Careful inspections of the pavement were made after each series of runs and following the completion of the test to determine the percentage of breakage in each section of the pavement. In the portion of the pavement on sand bedding the percentage of breakage was 1.9 for 2-in. brick, 0.0 for 2½-in. brick, 0.3 for 3-in. brick, 0.1 for 3½-in. brick and 0.0 for 4-in. brick. On the cement sand bed the percentage of breakage was 10.2 for the 2-in. brick, 1.0 for the 2½-in. brick, 0.0 for the 3-in. brick, 0.1 for the 3½-in. brick and 0.1 for the 4-in. brick.

The conclusions reached as the result of this investigation are as follows:

(1) That 2½-in. brick of the quality used in the Arlington traffic tests, when properly supported, will prove satisfactory for pavements carrying the heavier types of traffic.

(2) That brick of 2-in. thickness, when properly supported and of the quality used in the tests, will be adequate for pavements on streets carrying the lighter types of traffic.

(3) That a bedding course of plain sand is more effective in reducing breakage of brick than a cement-sand bedding course, the breakage being much less on the former than the latter. The depth of the sand bedding course should not greatly exceed ¾ in. Increasing the depth tends to produce roughness in the pavement.

(4) That cobbling of the brick is greatly increased as the spacing between bricks is increased.

(5) That the use of excessive quantities of asphalt filler is a common and serious fault in construction, unnecessarily increasing the cost and resulting in a condition which impairs both the appearance and the serviceability of the pavement.

(6) That base construction of other than the rigid type may in many cases prove entirely satisfactory. Macadam bases and those constructed of certain types of natural earth appear to be suitable when the local conditions are such that these types of construction will maintain their stability throughout the year.

(7) That no difference in the base construction is necessary for the different thicknesses of brick.

The above information was taken from a report by L. W. Teller, engineer of tests, and J. T. Pauls, associate highway engineer, United States Bureau of Public Roads, as published in the December, 1926, issue of "Public Roads," the journal of highway research of the United States Department of Agriculture, Bureau of Public Roads.

Spring Switch at End of Double Track at Burrton, Kan.

Spring Switches Being Used on the Santa Fe

An Old Device Has Been Modernized to Overcome Earlier Defects and Meet Present Operating Conditions

By C. W. BALDRIDGE
Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago

A SHORT time prior to the beginning of the present century several railways installed spring switches in main track turnouts to avoid the necessity of stopping trains to open and close the switch when making a trailing movement through the turnout. The spring switches then used were of two types. One consisted of the usual point switch, operated by a spring switch stand, while in the other type the points were connected to a rigid switch stand by a spring connecting rod.

The spring switch stands were so designed that when the switch was trailed through, the points were forced to the opposite position, the switch stand crank snapping into and remaining in a position corresponding to that taken by the points, thus leaving the switch open after it had been trailed through. In case of a switch equipped with a spring connecting rod the points were forced over a sufficient distance to permit the flanges of the wheels to pass between the point and the stock rail, the points then springing back to their original position or against the next pair of wheels, this operation being repeated with each truck which trailed through the switch and leaving the switch in its original position after the last pair of wheels had passed.

Old Types Were Unsatisfactory

These types of switches proved unsatisfactory and sometimes dangerous, owing to the fact that the spring stand switch was left in the position to which it was forced by the train trailing through it and also due to the fact that a badly worn wheel, one with a pronounced "false flange," when making a facing point movement, would sometimes wedge the point open when the false flange reached the point of contact between the switch point and the stock rail, causing the following pair of wheels to "split" the switch and resulting in a derailment. As this action was most likely to occur under trains moving at high speeds any accident resulting was usually serious.

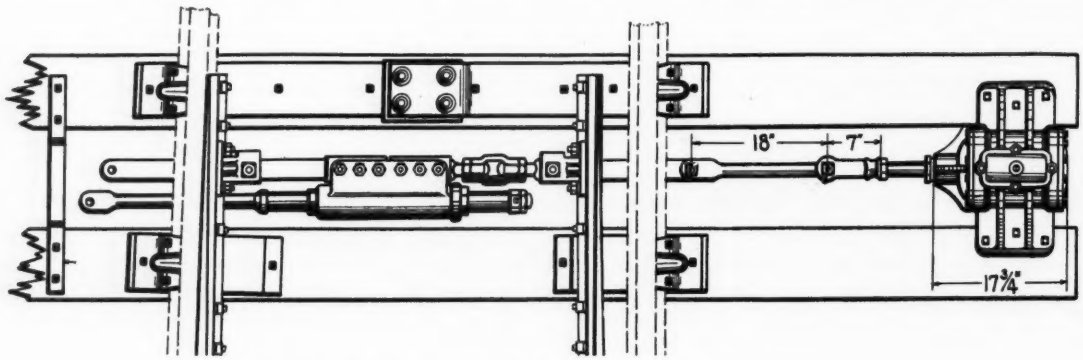
In the case of switches with spring connecting rods this result was also possible but did not happen often. The chief fault found with this type of switch was the failure of the switch points, head rods or clip bolts, due to the constant pounding of the points against the stock rail or the following wheel, when trains were trailing through the switch, these failures occasionally resulting in derailments. The hazard due to the use of either of these devices led to the almost complete abandonment of spring switches in important main tracks for many years.

Santa Fe Develops New Type of Spring Switch

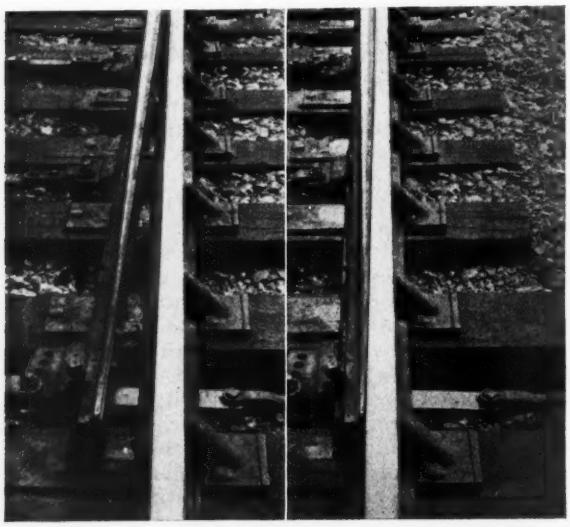
At one point on the Coast lines of the Atchison, Topeka & Santa Fe the end of a section of double track is located at a point where all trains are obliged to stop and where train movements are consequently at low speed. The additional slowing down or stopping to permit the opening and closing of the switch for trains using the track against which the switch was set caused considerable delay and as a result of these conditions some of the local officers began a

study of spring switches with the idea of eliminating the delays at this point without going to the expense of putting on switch tenders.

The first requirement was that the switch be left set for movements facing the double track. This, of course, eliminated the use of a spring stand, since with such a stand the switch remains set for the trailing movement when it has been run through. The use of a spring connecting rod was practicable, but in order to eliminate the danger of the switch points being forced open by a worn wheel when making a facing point movement, it was desired to use a stronger spring than had been used in the early installations of this type of switch. The use of a heavier spring, however, meant heavier blows of the switch point when snapping back after the passage of each trailing wheel. To remedy this an oil dash pot was designed and connected to the points to prevent their quick return to the normal position.



Spring Switch Layout With Dash Pot and Spring Head Rod



Spring Switch Point in Open and Closed Positions

The dash pot is equipped with fast and slow valves, so arranged that when the point is forced over by a trailing wheel the oil in the cylinder passes through the piston rapidly without retarding the movement of the point, while the return valve permits a much slower flow of the oil to its normal place in the cylinder. This arrangement holds the points open between the passage of successive pairs of wheels, while the pressure of the spring forces the oil back to its normal position and closes the switch within one minute after the last wheel has passed the switch. Until the switch is completely closed the block signals remain at danger and show the switch to be in the open position.

Precautions to Be Observed

The performance of the first spring switch as just described, which was installed in 1915, was so successful that additional switches of the same type have since been installed at the ends of double track, and at the departing switches at important yards until the Santa Fe now has 17 of them in use. To date only one derailment has occurred on account of these switches which would not have occurred if the switch had been of the rigid type, and this exception was the derailment of a way freight engine engaged in switching movements over a spring switch with long points.

It must be remembered that when any spring switch is being trailed through, the switch point, which was in the open position, must move over far enough to permit the wheels on that side to take the main rail, making this movement under the load of all the wheels which are upon the point, and that the longer the point the more numerous are the wheels and consequently the greater is the load upon it. In the derailment cited the heavy pressure upon the point broke one of the bolts holding a switch rod clip to the point, allowing the head of the bolt to fall between the point and the stock rail. This held the points open sufficiently to cause the engine truck wheels to mount the point and be derailed when it attempted to make the reverse movement. If the engine had gone back far enough to clear the block the signals would have given warning that the point was not closed properly but as switching movements only were being made this was not done and the result was a slow speed derailment.

This illustrates the fact that as short switch points as practicable should be used in order to keep the number of wheels on the switch point at one time at a minimum, and also that these switches should be used only in automatic block signal territory. In addition to these precautions they should be inspected frequently to keep them in good repair and in good operating condition. These switches are particularly valuable at the ends of yards where it is important to keep trains under considerable headway on account of adverse grades but a speed restriction of 20 to 25 miles an hour should be placed on trains trailing through them.

D. & H. Tests New Scrap-Rail Welded Cross-Tie

Utilizes Track Materials Released from Original Service for Further Use in New Form

IN AN effort to produce a strong, durable and economical substitute cross-tie from scrap track materials a welded substitute tie has been developed, utilizing scrap T-section rails. This tie has stood up favorably under an actual service test on the Delaware & Hudson for over a year, and from present indications shows promise of a number of advantages.

The new tie consists of two lengths of scrap rail, two flat or canted tie plates, and two heavy angle-irons or scrap angle bars, supplemented by four two-piece rail fastenings designed specially for use with the tie. In the actual makeup of the tie, the two lengths of rail, which may be of practically any weight or section, are spaced side by side with their inner flange edges about one inch apart. In this position the two tie plates are welded in their normal positions across the heads of the rails, centered under the locations of the track rails. Special features in connection with these plates are the rectangular punchings to hold the rail fastenings, and the fact that the plates themselves are so placed that their outside edges rest directly over the centers of the heads and the webs of the two component tie rails. By such an arrangement, loadings are thrown directly over the webs of the tie rails, rather than eccentrically to the outside edges of the heads of the rails, which not only reduces abnormal stresses in the rails but minimizes the tendency of the tie to roll under traffic.

The two angle bars mentioned as a part of the

The Test Installation on the D. & H. Which Has Been in Service for 14 Months

tie are used across the ends of the rails to form a rigid bond between the tie rails, and of primary importance, to form end bearing surfaces which will preclude lateral motion of the ties in the track. These bars, which may be any L-shaped bar, sheared to proper length, including common scrap angle bars, are placed with one leg extending beneath the flanges of the rail bases and the other extending upward against the rail ends. In this position each bar is welded in place, the welds joining the flanges of both rail bases to the lower leg of the bar, and the web of each rail to the upright leg of the bar.

On the Delaware & Hudson, where 15 of these ties have been in service in a heavy traffic yard lead for over a year, the ties are made of 90-lb. scrap

View Showing the Component Parts and the Welded Construction of the New Tie

rails, cut to 8-ft. lengths and held together across the top by 5/8-in. steel plates, 8 in. wide and 12 in. long. These plates are of uniform section, and, as shown in the accompanying illustrations, are welded securely to the heads of the tie rails wherever their edges come in contact with the heads. The ends of the tie rails are held together by means of old plain angle bars, sheared to 12-in. lengths, with a 3-in. horizontal leg and a 4-in. vertical leg, these being welded to the rails.

In the actual welding of the tie plates and end bars to the rails of the ties which have been in service, the electric-arc method has been used under the direction of the General Electric Company. This method has proved so adaptable in fabricating the ties, and the welds have stood up so successfully under the shock and batter of passing trains, that the General Electric Company is now manufacturing an automatic electric welding machine designed specifically to minimize the cost and to facilitate the welding in connection with the production of the scrap-rail ties on a large scale.

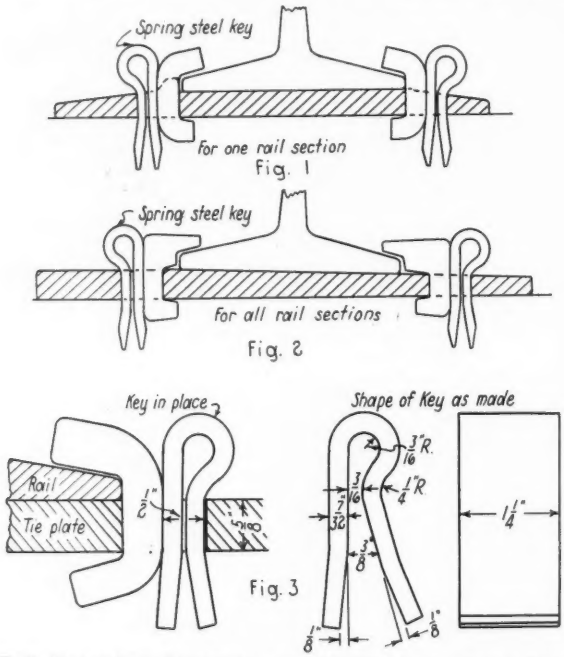
Rail Fastening Is of Simple Design

In the development of this type of tie, much study has been given to the subject of a suitable rail fastening. This has resulted in the design of the two general types shown in Figs. 1 and 2, both of which consist of comparatively simple rail clamps made from rolled shapes sheared to length, and spring-steel, broad-faced keys. The type of fastening shown in Fig. 1 is designed for use with a specific section of rail and its corresponding tie plate, while that illus-

trated in Fig. 2 is designed for use with a universally punched tie plate capable of taking any section or weight of rail, special shaped clamps being required in this case to fit each specific rail section.

The rail fastenings used in the actual test of the scrap-rail ties on the D. & H., and shown in the installation views, are in general similar to that shown in Fig. 2. However, it will be noted that these fastenings have been fitted with a steel cotter pin driven horizontally through coinciding recesses provided in the back of the rail clamp and in the front face of the key. While this has been a further assurance that the fastenings will remain securely in place, this expedient is now deemed unnecessary to a secure fastening, as is indicated by the more recent design of fastenings illustrated in Figs. 1 and 2 where the cotter is omitted. This is also indicated in Fig. 3, which shows in detail the type of fastening that has been adopted as standard on the D. & H. for further installations of the scrap-rail ties.

In this particular type, which in almost every detail is similar to the fastening illustrated in Fig. 1, it



Rail Fastenings Designed for Use With the Scrap-Rail Ties

will be noted that the entire fastening is designed to fit within a plate punching 1 in. wide, this to be occupied by the ½-in. clamp and the two $\frac{7}{32}$-in. legs of the key, allowing ⅛ in. for spring action. The width of the clamp and key, as indicated, is 1¼ in. In placing these keys, the bevelled edges of the key allow it to be placed in the tie plate hole and driven to final position. The removal of the keys is effected easily with the common track bar.

Many Advantages Are Claimed for New Tie

As a result of the test installation put in service on the D. & H. in April, 1926, many definite facts concerning the new ties have been demonstrated fairly conclusively. In the first place, it was found that little trouble was experienced in placing the ties in the track, in spite of the fact that they are much heavier than wooden ties, this work being greatly facilitated when the ties are unloaded carefully. It has also been found that there has been no movement of the ties in the track, and that the fastenings used not only permit the track rails to be laid as readily as is possible when they are secured by common spikes and afford about ten times the resistance to spreading, but that they remain tight in place and are free from rattling under traffic.

Other advantages of these ties are found in the wide supporting base which they afford, thereby permitting greater tie spacing than is common practice with wooden ties, and also in the single-point, centrally located clamps and narrow tie plates which minimize the tendency of the ties to roll and which permit only direct stresses to be induced in the tie rails. The H-section of the scrap-rail tie is, in itself, an additional advantage as it affords maximum strength with minimum depth, and at the same time provides an adequate bearing surface for anti-creeping devices.

To the advantages already mentioned are those which are anticipated through the securing of longer tie life and thereby reduced tie and tie renewal costs, and of large importance, through a stronger track construction and thereby reduced maintenance cost. That both of these latter advantages will be credited to the scrap-rail tie, as further installations are made and as the tests are extended, is evidenced by the fact that during the present test, extending over 14 months, no tie or track maintenance whatever has been necessary.

Use of Scrap Materials Cuts Cost of Tie

Another feature of these ties is their moderate cost when all factors are taken into consideration. This is made up of the scrap value of rails and end bars used and the cost of the tie plates and rail fastenings, plus the actual production cost of the tie, which by the use of an automatic electric welding machine, is estimated at about $0.60 per tie. In comparing the total cost of this tie as figured, with that of any other tie where tie plates are necessary as an auxiliary, credit should be allowed for the tie plate cost included above, as it should also be allowed for the ultimate scrap value of the scrap-rail tie when finally removed from the track. With these deductions, it is evident that the cost of the scrap-rail tie should be little more than the actual cost of fabrication.

While the test installation of these ties on the D. & H. has been made in the entrance to a classification yard, rather than on the main line, the results secured have been so favorable that that road is planning to equip its shop at Colonie, N. Y., with an automatic electric-arc welding machine, now being manufactured by the General Electric Company, for the extensive production of these ties. Under the present plan, all such ties will be confined to yard tracks and sidings where long period tests will be made to establish definitely their worth and adaptability for main line service.

As yet no test of these ties has been made in main line tracks or in track circuit territory, although it is understood that studies are being carried out with the view of developing an insulating shim which can be used with these ties and which will stand up under traffic.

We are indebted for the information contained in this article to William Dalton, of the General Electric Company, who designed the scrap-rail tie, and to H. S. Clarke, engineer maintenance of way of the D. & H., under whom the tests have been carried out.

The Improvement of Our Railroad

The Part That Maintenance of Way Forces Play in the Building Up of a Road

By W. E. McGRAW

Vice-President and General Superintendent, St. Louis Southwestern, Tyler, Tex.

A GETTING together of this sort affords the best of opportunities for us to become really acquainted with each other, and a better understanding, each of the other, naturally follows—all of which cannot help but tend to harmonize our efforts toward that common goal—"the welfare and improvement of our railroad.". As you know, by far the greater part of my time is spent on the line, which places me in a position constantly to observe the physical railroad, and it is with a great deal of satisfaction and pride that I am able to say there has been a steady, continual improvement in the general condition, as well as appearance, of our roadway and structures. Nevertheless, that is only what *has been* accomplished. As all of you no doubt realize, it would be possible for any man, (however intelligent and industrious he might be), to spend his entire lifetime on a railroad—thinking, planning and working his way along; and still, throughout that lifetime, even down to the last day, he would learn new things and new and better methods of accomplishment each day. Therefore, we see how impossible it is for any man ever to reach that point where he can, in fact, say or feel that "he's got it all."

Thoroughness Is Essential

There is no one of us who, as a general thing, does not know what he ought to do. The important difference in men is not the obvious disparity existing between their respective native intelligence; rather, in my opinion, the worth of a man is dependent upon the degree in which he possesses that rare quality of thoughful initiative, assuming, of course, an equality of moral character. Stated otherwise, let us suppose an example that on the one hand we have a man endowed with a quick native intelligence far above the average, but lacking the stamina and determination to cultivate that fertile brain and possess himself, from day to day, of knowledge and information concerning his work and appurtenant affairs. Instead, as is often the case, such a talented man may be mentally and physically lazy and rely upon his quick intuition, and the superficial knowledge thereby gained, to "get him by." What a pity is such a case and yet all of us have seen many of them.

On the other hand, here is a man to whom nature was less kind in the way of mental endowment; who is of that type to whom we usually refer as the "plugger." He gains his knowledge by hard study and continuous application, but once he has mastered a problem it is his always. Then having labored hard for it, he will most certainly apply his knowledge and, profiting by each and every mistake, (from the making of which no man is free), he grows gradually but surely and broadens from day to day.

It is not my intention to preach a sermon, or anything of that sort. I have merely put into words a thought which I am sure has many times presented itself to each of you. I have often thought that perhaps the relative importance of the maintenance department in railway work is not fully realized by any of us. Without deprecating the importance of any other department, I think it can be truly said that it is the backbone of the industry.

Successful Operation Requires Good Track

The best and most expensive of equipment and motive power would be of absolutely no avail without good safe tracks upon which to operate it. As we all know, the only source of revenue to a railroad is the service it has to offer; and that service consists in the safe, rapid and economical transportation of freight and passengers. When analyzing the subject, how plainly we see what a vitally important factor is the personal efficiency of every employee, regardless of his position. As a matter of fact, all other things being equal, the relative success or failure of any organization may rightly be said merely to be an expression of the net productive effort of the personnel of that organization. Getting down to cases—each day, somewhere in these United States, on somebody's railroad, there are from one to many derailments, more or less serious in consequence, attributable solely to poorly maintained tracks or bridges, or to the gross negligence or carelessness of some track man or bridge man.

Now, of course, I do not mean to say that every wreck is due to these causes, but the point I am making is that we should bend every effort to the quality of our work, to the close observance of the condition of ties, rail, joints, switches, bridge approaches, and the bridges themselves; with an eye out at all times for that irregular something which, (if not already a serious hazard within itself), will, if not corrected, develop into the cause of a bad wreck. Now, when we observe such a condition what do we do? Right now, not this afternoon, nor tomorrow morning, nor some other so-called "more convenient time"—but right now, get busy on that small, almost unnoticeable bad condition and rectify it completely.

Religiously pursuing that course soon gets us to that point where we know our section perfectly and intimately; all of its weaknesses and peculiarities; the exact places, if any, where an attack of high or swift water will likely cover or break the line or bridge, from drift accumulation and the pressure of water against them. All of those things, too numerous to mention, are conditions with which all of you have had much experience. Then, knowing our section and bridges thus intimately, when any extraordinary condition or situation arises we know exactly where to expect the blow and prepare for it, as the occasion demands. And, when from any cause the line or a bridge is broken or made unsafe for the passage of trains, we use every human means to protect any approaching train from running into it. That, above all, is the first consideration. Next is the clearing of the line and making it safe for passage, if

* Abstracted from an address presented at the sixth annual meeting of the Maintenance of Way and Sanitary Engineering departments of the St. Louis Southwestern at Paragould, Ark., on March 24, 1927.

it is of such a nature that we can accomplish it. If it is too big a job for us we get the news to the dispatcher at the quickest possible moment, with the necessary information as to what is needed.

It is not my purpose to try to tell you how you should run your section in all its many details and attend to your bridges, trestles and culverts. Doubtless there is not a man among you but could tell me many things about track and bridge work and the operation of a section of which I have never dreamed. But, I want to offer you this to think upon. As a whole you men have made for yourselves an enviable record in the building up and maintaining of this physical railroad, and it is thoroughly appreciated. Still, let us not lose sight of the fact that at the end of each day the record is closed—the entries, good or bad, stand unchangeable. The beginning of each new day offers us an unmarked page; finds us a better or a worse man than we were the day before, depending upon our attitude and the advantage we take, or fail to take, of the opportunity to profit by whatever mistakes we may have made. With the constantly changing conditions and the ever increasing demand and need for the man "who uses his head," it is absolutely incumbent upon us, as individual men and as a body, to use our every effort to go a little further and do a little better. We have done well and I feel and know that we're going to put on that added pound of steam and measure up to what is rightfully expected of us.

Some Suggestions for Construction Foremen

By W. V. Hedge
Foreman, Construction Sub-Department, Nashville, Chattanooga & St. Louis

A CONSTRUCTION foreman should be furnished with plans and specifications for the work to be done a few days in advance of the time he is to move his gang to the new job, so that he may study them and familiarize himself with the work. He should also be furnished with copies of all requisitions for materials that have been ordered, so that he may check them with the plans to ascertain whether or not any items have been overlooked.

Upon arrival at the site the foreman should learn the exact location of the work and arrange to have cars of material spotted in a convenient place and unloaded at once, so that cars may be released for other service and that a check may be made to determine if there are any shortages. In unloading materials he must use his best judgment in stacking or piling so that little or no re-handling will be necessary during the work. The material should also be piled or stored clear of all tracks and in a substantial way to avoid danger of personal injuries.

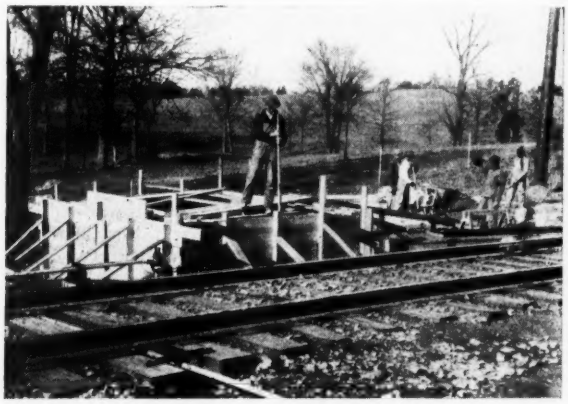
While unloading material the foreman should check it closely to see if the correct sizes and grades have been furnished and to ascertain whether or not all specifications have been complied with. If any discrepancies should be found, they should be reported promptly so that they may be corrected with the minimum delay.

Safe Practice in Flagging

Any movements of materials over running tracks on push cars should be protected by competent flagmen, properly equipped. To do this properly the foreman must be familiar with the ability and reliability of each of his men, must know the flagging and safety rules of the company and be able to instruct his flagmen properly in their duties.

After materials have been properly cared for, the next step is to get the actual work started. First of all, the foreman should be sure that he fully understands the entire set of plans and then make sure that the structure is laid out correctly, for if an error in the foundation location is not discovered until after the excavation is under way it will be expensive to correct.

In starting the work, and throughout the entire job, the men must be properly distributed so as to give each man an opportunity to do his best work. The foreman should assign all work to the men best fitted for it and should let each man feel a responsibility for the outcome of any work to which he may be assigned. He should, of course, keep in close touch with all the work and be ready at all times to lend his assistance or advice, so that no serious errors will be made and so that he can immediately re-assign each man just as soon as he completes a task. He should encourage his men to have confi-



The Work of the Construction Gang Must Be Organized by the Foreman

dence in their ability and help them to correct their minor mistakes without criticising them severely or harshly until their errors become too great, in which event he should assign them to less important work or dismiss them from the organization. The foreman should see that each man is equipped at all times with the proper tools to do his work most efficiently and that all tools are kept in proper working condition to obtain the best results.

Give the Men Advance Notice

It is a good practice for a foreman to inform a man at the close of one day if he wants him to take up different work on the following day, so that there will be no delay in his getting started on the new work the next morning. This also gives the man time to study the new task during the evening and a chance to work out a way to overcome any complications that might exist. If he fails to give any thought to his work and does not use this advance notice to any advantage, he should be allowed to seek employment elsewhere.

The foreman should take special pains to keep the men's time correctly, endeavor to have them paid off on the regular pay day, be courteous to all of them, listen to their grievances with an attitude of fairness, and endeavor to keep his entire gang in a contented state of mind.

What's the Answer?

What Our Readers Have to Say on Current Questions That Perplex Those Engaged in Maintaining Tracks, Structures and Water Supply Facilities

QUESTIONS TO BE ANSWERED IN THE AUGUST ISSUE

1. *What is the cause of frogs riding "hard"? What can be done to eliminate this condition?*
2. *Is an outside wooden guard rail necessary on bridges where an inside guard rail is used?*
3. *Is it practicable to assign individual tools to the members of section gangs to encourage better care of the tools?*
4. *What special precautions, if any, should be taken when painting the exterior of buildings in hot, dry weather?*
5. *Where a turnout or crossing is of a different section of rail from that of the track should the compromise joints be used at the frogs or a rail length away?*
6. *What is the best way to overcome the settling of the embankment next to the abutments or bulkheads of bridges?*
7. *In setting center stakes for the relining of main tracks what should be the maximum distance between the stakes on tangents?*
8. *What is the best method of protecting earth embankments of reservoirs from muskrats or other burrowing animals?*

How Close to Jacks Should Tamping Be Done in Raising Out of Face?

In surfacing track out of face how close to the jacks should the work be carried before the jacks are moved ahead?

It Depends on the Amount of the Raise

By T. F. Donahoe

General Supervisor, Baltimore & Ohio, Pittsburgh, Pa.

In surfacing track out of face up to a two-inch raise for either hand or machine tamping where one jack is used on each rail, the jacks should be set two ties ahead of the joint and both joint ties tamped before moving the jack to the next panel. If the raise is three or four inches and only two jacks are used they should be set three or four ties ahead of the joint since there is danger in such cases of raising the track too high back of the jacks due to the heavy weight of the track ahead of the jack. If ballast has been unloaded from center dump cars and plowed off so that it covers the track to the top of the rails three jacks should be used on each rail. In making a run-off for trains when three jacks are used there is a decided advantage in dropping each set of jacks only a part of the raise at a time.

The Tamping Should Not Be Done Too Close to the Jacks

By J. E. Karrer

Extra Gang Foreman, Chicago, Burlington & Quincy, St. Joseph, Mo.

In surfacing track out of face the tamping should not be carried closer to the jacks than one rail length, or about 33 ft., before the jacks are moved ahead. However, this depends largely on the amount the track is being raised. On a one-inch lift the ties can be tamped to within one-half a rail length of the jacks, while on a five or six-inch lift they should not be tamped closer to the jacks than 1½ rail lengths. If the work is carried too close to the jacks it is liable to cause high spots in the track just behind the locations of the jacks.

Preventing Incrustation of Pipe Lines in Lime-Soda Treatment

What practical changes can be made in the treatment of water where the lime-soda process is used which will prevent incrustation of the pipe line without increasing boiler corrosion?

Care Must Be Used Not to Increase Corrosive Properties of the Water

By William M. Barr

Chief Chemist, Union Pacific, Omaha, Neb.

This is a question to which the operators of railway water softeners gave little attention for many years. The incrustation of pipe lines from treated water was taken as a necessary accompaniment of water treatment. Since the softening of municipal water supplies has been taken up, the question of pipe line incrustation has become more serious, and attempts have been made to check it. Most municipal water softening plants introduce carbon dioxide into the treated water, both to prevent after-precipitation, and to improve the taste, but the application of this method to railroad water softening has not been made. There have been cases where

the addition of a weak acid solution or an acid salt such as sodium bisulphate has been used to check this after-precipitation; this, however, is a rather dangerous practice, as a slight excess is likely to increase corrosion.

Sodium aluminate is being used quite extensively in water softening, primarily for the purpose of effecting a more complete reaction in cold waters, and therefore reducing the degree of hardness. The fact, however, that this chemical produces a more complete reaction, naturally results in less after-precipitation, and therefore less incrustation in pipe lines. The use of this chemical has not been continued for a long enough time to make possible any very positive statement relative to the amount of incrustation that may be found in pipe lines after any given length of time. One thing, however, is certain, the addition of this chemical will not result in an increase in boiler corrosion.

On the other hand, we are now treating a certain water quite successfully, first by the addition of sufficient lime and soda ash not only to make the reaction complete, but to supply a moderate excess of caustic alkalinity, and to this water, after the reaction has taken place, is added a small amount of alum solution amounting to a grain or a grain and a half per gallon. This results in the production of a good floc, causing the precipitate already formed to settle readily and completely, and sending an almost clear water to the filters. In addition to this, it has a definite effect on the after-precipitation, and we do not anticipate any trouble from this water by incrustation developing in the cold water lines.

No Trouble Has Been Experienced When Proper Precautions Were Taken

By H. W. Faus

Engineer of Tests, New York Central Lines, New York

We have experienced no trouble with incrustation of pipe lines carrying treated water when a minimum reaction time of five or six hours has been allowed and when the water is properly filtered. In some instances we use sodium aluminate to obtain better reaction and precipitation in the treating tank.

Floors for Section Tool Houses

What is the best type of floor for section tool houses?

Substantially Built Plank Floors Are Satisfactory

By Roadmaster

The floors of section houses often received little attention in the past, either in their design or maintenance, and many of the old types still exist which are inadequate for the service demanded of them. Like the track, these floors have been called on to sustain constantly increasing loads, while the introduction of the motor car and other labor-saving devices has made it necessary to use the tool house as a work shop to a greater extent than was formerly the case, when its function was almost wholly to provide a shelter for the hand car and track tools. The desirability of protecting track bolts, spikes and other small track materials from the weather has led to the installation of bins for storing these articles in the tool house, thus placing a heavy load on the floor.

Wooden floors are perhaps the most satisfactory when all factors are considered, but they should be of substantial construction. The planks should not be less than two inches thick and the joists should be of the proper size and spacing to prevent the floor from sagging. While not necessarily of dressed lumber they should be reasonably smooth and large cracks between the planks should be avoided. If the tool house is satisfactory otherwise, and it is certain that its location will not be changed, a concrete floor is often economical. For unimportant branch line tool houses cinder floors will often be sufficient and they can be installed and maintained cheaply.

A Concrete Floor Is Preferred

By J. Sweeney

Supervisor, Chicago & Eastern Illinois, Danville, Ill.

I prefer a concrete floor for section tool houses, since there is not the danger of fire or of injury to the men as is the case with wooden floors. The first cost of the concrete floor is a little greater than for wood, but there is no expense for maintenance.

Churning Ballast on Ballast Deck Bridges

How can the churning of ballast on ballast deck bridges be prevented?

The Ballast Must Be Clean and of Good Quality

By Engineer Maintenance of Way

Assuming that the ballast is clean when it is applied and that the deck is designed to provide proper drainage, churning on ballast deck bridges is due to the ballast becoming clogged either by dust and small particles produced by the disintegration of the ballast or from foreign material dropping from cars passing over it. Roads handling large shipments of coal or of livestock often have trouble from this latter cause, while a ballast which is soft or which disintegrates easily under traffic will soon churn. When the ballast has become sufficiently foul so that churning is general the only effective remedy is to remove it and apply fresh material of a good quality.

Where ballast becomes foul from material dropping from cars the situation can be helped by removing the top of the ballast before the dirt has had a chance to penetrate deeply and to replace it with fresh ballast, or to replace the old ballast after it has been cleaned. This latter method, however, is seldom economical, owing to the difficulties in cleaning the ballast economically.

Much of the trouble on ballast deck bridges in the middle west is due to the fact that the stone available for ballast is often soft and the dust which is formed by its disintegration under traffic or the action of the frost cements together and closes the voids between the stones, thus preventing drainage. The writer knows of one case where stone ballast of this character gave so much trouble from churning that it was removed and replaced by cinders, whereupon no further churning occurred. At one time it was not considered good practice to allow cinders to come in contact with reinforced concrete, but if the concrete is made and installed properly no harm will result.

Chats, which are the tailings from zinc ore, provide a good ballast for ballast deck bridges, if they are not crushed too fine. Formerly they came from the crushers with many of the particles resembling torpedo sand, but more recently the stamps have been arranged for more complete crushing and the product is more like a fine sand. The coarser chats drained well and foreign matter dropped on the ballast did not penetrate deeply, owing to the small voids between the particles. The more finely crushed material, however, has a tendency

to churn, owing to the large amount of fine material which it contains.

Churning sometimes occurs on wooden floors of ballast deck bridges of certain designs due to a slight sagging of the floor under the track, which allows water to collect. This can be remedied by boring a hole through the floor planks at the low spots, taking care to swab the edges of the holes, after they are dry, with hot creosote, to protect the wood from decay.

Protecting Concrete Cinder Pits from Injury by Heat

What is the best method of protecting the concrete in dry cinder pits from injury by the heat?

Does Not Favor the Use of Concrete Pits

By J. A. Stocker

Chief Engineer, New York Central, Ohio Central Lines, Columbus, Ohio

We have found that concrete in cinder pits deteriorates rapidly if the hot cinders are permitted to come in contact with it and do not favor construction which permits this, although we have several installations of this character. Our experience has been that a good quality of vitrified paving brick, laid with thin cement mortar joints, is fairly satisfactory for ash pit construction and that our brick ashpits have given much better service than the concrete pits. Although we have never followed the pratcice, I believe that a cheap fire brick lining for ashpits would give good results.

The A. R. E. A. Recommendations Are Accepted as Good Practice

By F. E. Morrow

Assistant Chief Engineer, Chicago & Western Indiana, Chicago

The recommendations of the American Railway Engineering Association, as presented by the Committee on Shops and Locomotive Terminals at the convention in 1922, are accepted as good practice and are as follows:

(a) The concrete should be of a dense, rich mixture with preferably slag or trap rock for the aggregate.

(b) For safety and economical maintenance, both rails should be supported on cast iron or cast steel pedestals, even though a continuous curtain wall be used under one rail.

(c) The pavement should be vitrified or fire brick on a concrete base.

I have been advised that in some instances the top of the concrete walls of such pits have been protected with a cast iron coping.

Length of Guard Rails for Main Track Turnouts

What is the shortest length of guard rail that can be used satisfactorily for high speed main track turnouts with No. 11 or sharper frogs?

The Present Day Tendency Is Toward Shorter Guard Rails

By Engineer Maintenance of Way

While the standard length of guard rail for turnouts in either main tracks or sidings was formerly 15 ft. the use of shorter guard rails on sidings has become more prevalent during the past 10 years and the trend at present on some of the roads handling fast and heavy traffic is toward the use of shorter guard rails for main tracks also. The purpose of a guard rail is to prevent the wheels from striking the point of the frog, and to accomplish this it is necessary only to maintain the guard for a short distance opposite the point of the frog.

One of the reasons for the use of long guard rails in the past was that they soon became loose in service and were easily torn up by derailments, but the use of improved fastenings and also of special forms of guard rails has lessened the importance of length in this respect and guard rails seven or eight feet long are now giving satisfactory service on tangent tracks on several important roads. Where turnouts must be installed on curves in main tracks a long guard rail is often of advantage since it permits the wheels to be guided to clearance distance from the frog more gradually.

Leveling Up the Right of Way

To what extent is it advisable to level up the right of way so that mowing may be done by machines instead of by scythes and to improve the appearance?

It Depends On the Saving to Be Effected

By A. N. Reece

Chief Engineer, Kansas City Southern, Kansas City, Mo.

The extent to which it is advisable to level up the right-of-way so that mowing may be done by machines instead of by scythes and to improve the appearance should be determined by the saving effected in mowing by machines instead of by hand. In other words, the cost necessary to prepare the ground should be comparable with the saving, to the end that the roadbed will present a better appearance at no material increase in cost.

The Savings Capitalized Will Determine Amount to Be Spent

By C. H. Brodbeck

Division Engineer, Nashville, Chattanooga & St. Louis, Paducah, Ky.

From our experience in cutting right-of-way the average saving to be made by mowing with machine instead of by hand amounts to $2.55 for each cutting. From an economical standpoint this will justify an expenditure of approximately $36 an acre for leveling up and otherwise putting the right-of-way in condition to be cut by machine, where it is the practice to mow once a year, or of approximately $72 an acre where the mowing is done twice a year. This is based on interest at 7 per cent. The expenditures warranted merely to improve appearances depend largely on the location and the effect desired.

It Depends On the Location

By G. M. O'Rourke

Roadmaster, Illinois Central, Carbondale, Ill.

Leveling of the right-of-way to permit mowing by machine should be done wherever the expense is not greater than the difference between the cost of mowing between the two methods will warrant. The location is often a deciding factor since the expense may be well worth while in one place and of little value at another. Where the view at road crossings can be improved it is always desirable. Reasonable expenditures for leveling up station grounds and the right-of-way for some distance each side of the grounds are justified from the

standpoint of appearance, but each situation must be considered by itself, always taking in account the expense and all other factors that may have a bearing on the matter.

Should Second-Hand Timber Be Used for Bulkheads on Trestles?

Is it good practice to use second-hand timber for bulkheads at the bank bents of timber trestles?

Should Be Used Only for Temporary Service

By I. L. Brown

General Foreman, Bridges, Buildings and Water Service, Atchison, Topeka & Santa Fe, Arkansas City, Kan.

Second-hand timbers should not be used for bulkheads at the bank bents of timber trestles as a general rule, although I have used second-hand stringers for this purpose in renewing decayed bulkheads where it was certain that the material would last until the structure would have to be renewed. In new trestles or those which will not require replacements in the near future the use of second-hand timber bulkheads is not economical since the cost of replacing them is too great for the service life to be obtained.

Only Sound Timber Should Be Used

By Bridge Engineer

While the bulkheads at the bank bents of timber trestles are not required to sustain the loads imposed on other members of the structure their location is such that they are particularly exposed to conditions favorable to decay and for that reason there is no economy in using second-hand timber for this purpose, since the expense of replacing them before the rest of the bridge is renewed is a considerable item.

Aside from this feature there is also to be considered the protection of the members with which the bulkhead comes in contact, since the stores of decay are soon communicated to sound timber and the early rotting of the bulkhead will soon affect the piles of the bank bent. Hence it is important that the bulkhead be of sound timber when installed so that it may last as long as possible, and also that it will not be the cause of hastening decay in the structure itself.

Wreck Attributed to Abutment Failure

The failure of an abutment led to the derailment of a passenger train on the Los Angeles and Salt Lake unit of the Union Pacific System near Clayton, Cal., on February 15, resulting in the death of 1 employee and the injury of 12 employees and 9 passengers. This accident was investigated by representatives of the Bureau of Safety of the Interstate Commerce Commission, from whose report the following information is taken.

The bridge involved in the accident consisted, from the west end, of one 110-ft. truss span and two 62-ft. plate girder spans supported on concrete abutments and piers.

During the three days prior to the accident the rainfall in this vicinity had varied from 5.30 to 7.58 in. Measurements made two days after the accident and after the flow of the stream had been altered by the derailed equipment, showed that the bed of the stream between the east and the west piers had been washed out to a maximum depth of about 12½ ft., while between the west pier and the west abutment the depth of the scour varied from about 12½ ft. to 1½ ft. All three spans of the bridge collapsed under the train.

Conclusion

After its investigation of the accident the Bureau of Safety drew the following conclusions:

"From the evidence presented, it is believed that the southern or upstream corner of the abutment was undermined by the flow of water in the creek and that it failed under the combined weight of the 110-ft. truss which it supported and the engine of train No. 8. The middle part of the abutment tipped forward and over, having been broken from each of the wings by vertical cracks. The southern or upstream wing was also tipped forward to a considerable extent and it settled obliquely in a downstream direction. The northern or downstream wing remained in place substantially undisturbed.

"The middle part of the abutment, when it pitched forward under the weight of the train, carried with it the 110-ft. truss, crowding the middle span of the bridge in an easterly direction, which in turn detached two concrete blocks from the west pier. The concrete separated at joints between different days' work in its original construction. The middle span, itself forced easterly over its east pier, in turn forced the eastern span to overlap the east abutment; in fact, the entire bridge was carried forward in an easterly direction, all resulting from the failure of the west abutment. The speed of the train enabled all this to happen before the collapse of the bridge was complete.

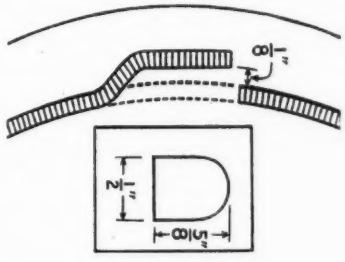
"Concerning what premonitory signs of failure existed before train No. 8 came upon the bridge can only be a matter of conjecture. Very likely, however, evidence of approaching failure was not lacking in the condition of the west abutment. There were probably cracks in the concrete of pronounced degree, indicative of weakness. There was no reinforcing steel or iron bars in the construction of the abutment. The comparative weakness of concrete in tension is well known. It should lead to great care in the inspection of concrete structures which are not adequately reinforced. The separation of the west pier at the joints, however, is not so grave a matter when compression loads only are to be sustained.

"The eroded banks of the river, immediately upstream, should have been a sufficient warning of the probable danger of undermining and have led to the taking of corrective measures. It does not appear from the evidence that proper engineering care and maintenance was exercised in respect to the west abutment which was so obviously exposed to erosive conditions."

Life of Ties on English Railways.—The long life of railway ties in England, where wood preservation has long been the practice, is evidenced by an abstract from the annual reports of the four leading systems of that country, which appeared recently in the Railway Gazette of London. According to these reports the average tie renewals per mile of track on the line having the best record was 54, as compared with 97 on the line having the heaviest renewals. These figures compare with averages for the same systems ranging from 67 to 130 in 1925 and indicate that fluctuations in the use of ties occur abroad the same as in our own country.

A New Type of Perforated Drain

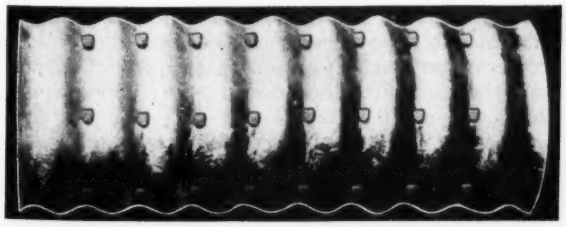
THE CANTON Culvert & Silo Company, Canton, Ohio, has placed on the market a new type of perforated corrugated iron drain pipe known as its type "B," in which the perforations are punched in the upper two-thirds of the circumference in such a way as to leave a tongue of metal over the punched



Details of Perforations

hole at a distance of about one-eighth inch from the body of the pipe to retard the entrance of silt or dirt into the pipe. This type of pipe can be supplied in any desired diameter and may be furnished either in full-circle riveted construction or in nestable form for assembly in the field. Tees, ells and curved sections can be furnished as well as flat bottom pipe for use where the headroom is limited.

The pipes are manufactured of Toncan copper



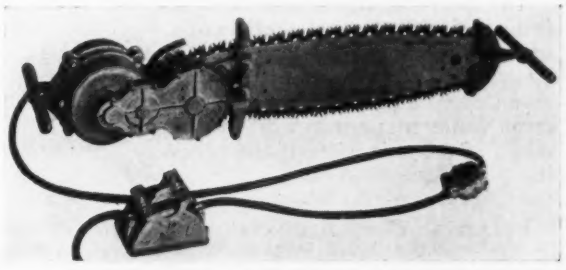
The New Type "B" Perforated Drain Pipe

molybdenum iron, a refined iron with an alloy of 0.4 per cent copper and 0.05 per cent molybdenum, which is said to have a high resistance to corrosion. The thickness of metal ranges from 16 gage to heavier gages, depending on the diameter of the pipe. The advantages claimed for this type of pipe are efficiency in drainage, strength and durability, ease and economy of transportation and installation, and economy in first cost and in service life.

A New Portable Link Sawing Machine

A NEW development in hand-operated, power-driven saws is the Wolf portable link sawing machine recently put on the market by the Reed-Prentice Corporation, Worcester, Mass. This saw, which is designed for a wide range of heavy cross-cutting and is adaptable to many classes of railroad construction and maintenance work, is readily handled by one or two men and is said to have a cutting capacity three or four times that of the ordinary hand-plied saw.

The new saw consists essentially of a built-up steel frame, around the periphery of which operates a continuous chain of cutting and raker links, two handles, and either one or two motor drives with suitable control switches. The frame is made up of four pieces of heat-treated saw steel, rigidly assembled by



The No. 2 Wolf Sawing Machine

electric welding, and has a channel around its outer edge to guide the travel of the saw links. The handles of the saw, with suitable guards, are located at either end of the machine in convenient positions for either horizontal or vertical cutting. The handle and guard at the outer end, on single motor saws, are readily removable to permit withdrawing of the saws in case wedging is necessary to prevent pinching.

The saw links, which consist of cutter and raker links, are spaced and held firmly in alinement by bushings and link pins. All of these units are made of high grade steel, accurately machined and heat-treated to give the necessary hardness and resiliency.

The action of the saw links is the same as those in a rigid saw, the possibility of buckling being elimi-

nated as rakers and cutters act in opposition to each other. In operation, the links on the cutting side of the machine travel toward the motor, thus always keeping the machine against the work and eliminating dogging or fastening. All of the links of the saw are interchangeable and readily removable.

The saw is furnished with a single or double-end motor drive, operated on 220-volt, 60-cycle, 3-phase alternating current, either from a power circuit or a portable motor-generator set which can be furnished with the saw. The motors are of the induction type, sturdily constructed and enclosed in a two-part dust-proof housing rigidly bolted together. The motor pinion, sprocket shafts and drive gears are all one-piece forgings of alloy steel, closely machined to enable complete interchangeability. All journals are supplied with double row ball bearings.

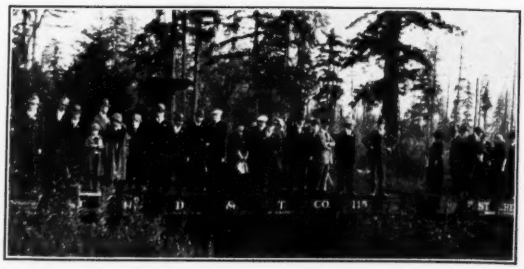
In operation, the saw is started and stopped conveniently by a foot switch, and a three-point reversible plug of special design permits turning the saw over and reversing the motor and cutting direction of the saw links, thus equalizing the wear on the teeth and reducing the necessity of frequent filing. Throughout, adequate provision has been made for the positive lubrication of the motor parts and saw links.

Protection to the operator of the saw and to the saw itself is afforded by a number of safety features, which include a circuit of ample capacity to handle safely the curent supplied to the machine, protective guards at either end, a large factor of safety in the saw links, and the provision of a breakable safety pin through the sprocket hub and sprocket shaft to counteract any undue stresses which may come upon the saw while in operation. The Wolf machines are made in three models, No. 1 and No. 2, with single motor drive, and No. 1A with double motor drive. These machines weight 70 lb., 90 lb. and 110 lb. respectively, the first two models mentioned having a cutting capacity of 24-in. while the latter has a capacity of 30 in.

The portable motor-generator set which can be furnished with the saw consists of a 4-cylinder, automobile type engine, direct connected to a 3-phase, 60-cycle, 220-volt alternating current generator, mounted on a portable carriage and fitted with sufficient cable to permit work within a considerable range of the unit without the necessity of relocating it.

RECAPTURE CONTESTED.—The St. Louis & O'Fallon, on May 3, filed a petition in the United States District Court at St. Louis, Mo., for an injunction to restrain the Interstate Commerce Commission from enforcing its orders in the recapture case involving that road. The petition attacks the decision on the grounds that the commission did not find or attempt to find the actual value of the O'Fallon property as of the recapture period and also that the decision is in conflict with section 15-A of the Transportation Act which provides that no payments of excess earnings are required on the part of any carrier unless and until the commission shall have so adjusted the rates that the carriers subject to the act a whole (or as a whole in each of the rate groups designated by the commission) will, under honest efficient and economical management, earn an aggregate railway net operating income equal to a fair return upon the aggregate value of the property held for and used in the service of transportation. The court has set this case for hearing early in October.

With the Associations



Maintenance of Way Club

"Track on Bridges and Bridge Approaches" was the subject considered at a meeting held on Thursday, May 19, the discussion being opened by the reading of a short paper by Frederick G. Vent, assistant engineer, bridge department, Illinois Central. This was the last meeting to be held by this club until the fall season.

Metropolitan Track Supervisors' Club

The Metropolitan Track Supervisors' Club will hold its annual outing on Saturday, June 25, at Asbury Park, N. J. Plans for the occasion, which include a special boat and train from New York through the courtesy of the Central Railroad of New Jersey and accommodations at the Berkeley-Carteret, are about completed and it is planned to hold the outing regardless of weather conditions.

The Wood Preservers' Association

The summer meeting of the officers and members of the executive committee, the chairmen of committees and other interested members of the association, will be held at the Lorraine hotel, Madison, Wis., on July 12-13. A feature of the meeting will be an inspection of the facilities and of the work being done by the United States Forest Products Laboratory. The Committee on Wood Preservation of the American Railway Engineering Association will meet at the same time and at the same place.

The proceedings of the Nashville convention are now in the bindery and will be distributed to the members early in June.

The Engineering Association

In addition to the nine standing committees which held meetings and organized their year's work during April, nine additional committees met during May for the same purpose. The Committee on Wood Preservation met in Chicago on May 3 with 17 present; the Committee on Iron and Steel Structures in the same city on May 6 with 12 present, and the Committee on Economics of Railway Operation in Chicago on May 10, with 11 present, while the Track Committee met in New York on the same date, with 20 present. The Committee on Economics of Railway Labor met in Chicago on May 12 with 13 present; while the Committee on Records and Accounts met in Cincinnati on the same date with 12 present. The Committee on Uniform General Contract Forms met in New York on May 16; the Committee on Grade Crossings met in Chicago on May 17 and the Committee on Masonry in the same city on May 27.

F. J. Stimson has been elected treasurer of the association, to succeed G. H. Bremner, deceased.

The Material Market

CONFIDENCE in current business conditions is reflected in the rate of production in the iron and steel industry during the month of May. It was close to 90 per cent of capacity in the Chicago district and around 73 per cent in the Pittsburgh area, and while not equal to the output earlier in the year was well above the rate of production during May, 1926. This record is particularly significant by reason of the retarded activity in certain lines which are normally large users of iron and steel—notably the automobile industry, the oil fields and agriculture. However, construction continues active, particularly in large buildings in which steel is used in large tonnages.

Another factor that has had its effect is the increased activity in car and locomotive inquiries and orders, for the 60 locomotives and 3,500 freight cars recently ordered by the New York Central and the 80 locomotives bought by the Erie will in themselves produce an appreciable demand for steel, particularly plates and structural shapes.

Activity in Track Supplies

While the present reason is not an active one in the track supply field, from the standpoint of new business, it is an important period in production. In the Chicago territory shipping orders against existing contracts for fastenings are being received in sufficient volume from the railroads to require the manufacturers to operate at about 80 per cent of capacity. New orders are also being placed and a number of sizeable orders are pending. During one week in May orders for track supplies placed at Chicago totaled 5,000 to 6,000 tons. In the East an order for 35,000 rail anchors by the Boston & Maine was an item of comment.

Rail orders placed by two eastern roads at Chicago for a total of 12,000 tons are said to be the forerunners of the secondary season of rail buying and are expected to be followed soon by active inquiries for large tonnages by the Norfolk & Western and the Chesapeake & Ohio.

Prices Somewhat Lower

Prices have manifested a moderate weakness in some quarters. Wire products are lower as will be noted in the items for nails and barbed wire given in the table. No change has yet been indicated for plain wire, however. Structural materials, especially plates and shapes, are softer. Furthermore, the spread between fabricated steel and plain material is now smaller than normally and is said to leave the structural shops an exceedingly small operating margin, indicating that this is a field in which competition is decidedly keen.

The scrap market is slow and prices have been depressed further, as is seen in the table of scrap quotations. The railroads have considerable tonnages for sale, but the list is not as long or the tonnage as great as that reported last month.

Iron and Steel Prices Per 100 Lb.

	April		May	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	$2.80 to $3.00	$2.90	$2.80	$2.90
Track bolts, ¾ in. and over	3.90 to 4.00	3.90	3.90 to 4.00	3.90
Track bolts, ¾ in. and under	70% off list	70% off list	70% off list	70% off list
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel	2.35	2.35	2.35	2.35
Boat spikes	3.25	3.25	3.25	3.25
Plain wire	2.40	2.45	2.40	2.45
Wire nails, keg	2.55	2.60	2.50 to 2.55	2.55 to 2.60
Barb wire, galv.	3.25	3.30	3.20 to 3.25	3.25 to 3.30
C. I. pipe, 6 in. to 12 in., ton		44.20 to 45.20		43.20 to 44.20
Plates	1.80 to 1.90	2.00 to 2.10	1.80 to 1.90	2.00
Shapes	1.90	2.00 to 2.10	1.80 to 1.90	2.00
Bars, soft steel	1.90	2.00 to 2.10	1.85 to 1.90	2.00 to 2.10
Rivets, struc.	2.75	2.85	2.75	2.85
Conc. bars, billet	1.90		.190	
Conc. bars, rail	1.75 to 1.80	1.90 to 2.00	1.70 to 1.80	1.90 to 2.00
Rails, per gross ton f.o.b. mills		43.00		43.00

Scrap Prices Per Gross Ton at Chicago

	April	May
Relaying rails (including angle bars)	$26.00 to $31.00	$26.00 to $31.00
Rails for rerolling	16.00 to 16.50	15.25 to 15.75
Rails less than 3 ft. long	16.50 to 17.00	15.50 to 16.00
Frogs and switches cut apart	14.50 to 15.00	13.50 to 14.00
Steel angle bars	14.50 to 15.00	13.50 to 14.00

Lumber Market Uncertain

Affairs in the lumber market are in a rather complicated state at the present time, owing to the fact that the ultimate effect of certain current influences is now a matter of doubt. One of these is the lessened activity of home building and the prostration of the lower Mississippi valley by the flood. Another, also said to be the result of the flood, is a sudden advance in the prices of hard wood lumber in the middle west. The flood has caused little interference with yellow pine production but has resulted in extensive suspension in southern hard wood operations. The third factor is the agreement of west coast operators to curtail production, which to date is estimated to result in a reduction of at least 100,000,000 ft. b. m. in the annual output.

The outcome in the middle west will depend in large measure on the rapidity with which reconstruction is undertaken in the flooded area. Enormous rebuilding will be necessary, but the rate at which this is carried on will depend to a large extent on credit arrangements set up. On the west coast, operators have met with some difficulty in maintaining prices in spite of the curtailment of output. Railroad purchasing agents in particular have resisted the efforts to hold up prices and with the failure of the Japanese market and less active buying on the Atlantic coast the outcome is as yet uncertain.

Southern Pine Mill Prices

	April	May
Flooring, 1x4, B and B, flat	$41.75	$41.49
Boards, 1x8, No. 1	37.09	35.93
Dimension, 2x4, 16, No. 1, common	26.67	26.65
Dimension, 2x10, No. 1, common	29.42	30.61
Dimension, 2x4, 16, No. 2, common	23.81	23.83
Dimension, 2x10, No. 2, common	21.75	24.38

Douglas Fir Mill Prices

	April	May
Flooring, 1x4, No. 2 clear, flat	$26.00	$27.00
Boards, 1x8, 6 to 20, No. 1, common	16.00	16.00
Dimension, 2x4, No. 1, common	17.00	17.00
Dimension, 2x10, 16, No. 1, common	17.00	17.00
Timbers, 6x6 to 8x8, No. 1	20.00	20.00
Timbers, 3x12 to 12x12, rough	18.00	19.00

As noted on another page, production of ties in the lower Mississippi region has been seriously crippled and will not be restored to normal for a number of weeks. However, inasmuch as this is only one of many tie producing areas, it is impossible to say at this time how much the lost time in this field will affect the total production for the country.

No changes are noted in the prices of Portland cement for the market points listed below. Prices are per barrel in carload lots, not including package.

New York	$2.03	Minneapolis	$2.22
Pittsburgh	2.04	Denver	2.85
New Orleans	2.40	Dallas	2.05
Chicago	2.05	San Francisco	2.51
Cincinnati	2.32	Montreal	1.15

Railway News

Briefly Told

The Great Northern celebrated the seventieth anniversary of its existence recently by displaying at St. Paul, Minn., a prospectus of the Minnesota & Pacific, published in New York in 1858, which contained an outline of the charter granted to that company on May 22, 1857. The charter made no restrictions as to service or rates and covered the construction of an 80-mile line in Minnesota.

On April 1, when the partial suspension of operations began in the bituminous coal fields, the railroads had on hand a reserve of 22,806,000 tons of fuel coal, or 59 days supply, according to a survey made by the Bureau of Mines of the Department of Commerce. This was the largest stock ever accumulated by the railroads and exceeds by 3,000,000 tons the reserve before the 1922 strike.

The hearing at Chicago on the application of the conductors and trainmen on the western roads for increases in pay closed on May 24. By consent of both parties to the controversy the time in which the arbitrators must give their decision was extended to June 26. The hearing on the application of the firemen on 11 southeastern roads for increased pay is still in progress before a board of arbitration in Washington, D. C.

The Spokane, Couer d'Alene & Palouse, all of whose stock is owned or subscribed by the Great Northern, has been authorized by the Interstate Commerce Commission to acquire and operate the lines of the Spokane & Eastern and of the Inland Empire, successor companies to the former Spokane & Inland Empire. The Spokane & Eastern has approximately 53 miles of line, while the mileage of the Inland Empire is about 126. Both of these roads are operated electrically.

A bed plate casting, weighing 254,000 lb. and said to be the largest casting ever made, was shipped from Hamilton, Ohio, on April 26, over the Pennsylvania, destined to the Carnegie Steel Company's plant at Youngstown. The casting was 29 ft. 6 in. long, 15 ft. 5 in. high and 11 ft. 2 in. wide. Two special steel cars each with a capacity of 220,000 lb. were used for the shipment and the total weight of the casting and cars, together with the necessary bracing and blocking was 405,000 lb.

The Department of Public Works of the State of Washington is formulating a definite policy for the elimination of grade crossings of public highways and railroads and information regarding such crossings has been asked from each railroad. The railroads will be asked to confer on the apportionment of costs of grade crossing elimination and in the future will be asked to bear a portion of the cost when a highway is relocated so as to eliminate one or more grade crossings.

Revenue freight car loadings in the week ending May 14, totaled 1,029,126, a decrease of only 622 cars as compared with the corresponding week of last year, despite the coal strike and the floods, and the increase of 43,247 cars as compared with 1925. Coal loadings for the week amounted to 163,150 cars as compared with 167,678 in the corresponding week in 1926 and 156,732 cars in 1925. The cumulative total for the first 20 weeks for the current year was 19,309,366 as compared with 18,799,955 and 18,462,225 in the corresponding periods for 1926 and 1925, respectively.

A special committee headed by Herbert Hoover, secretary of commerce, with Thomas P. Henry, president of the American Automobile Association, and Walter G. King, president of the National Safety Council, as its other members, will select the winners in a contest conducted by the American Railway Association among school and college students on the subject of the prevention of grade crossing accidents. Three cash prizes of $250 will be awarded for the best essays by students from grammar schools, high schools and colleges, respectively, and the authors of the three winning essays will be given a trip to Washington where the cash prizes will be distributed.

According to a statement issued by the Interstate Commerce Commission, 61,302 women were employed by the Class I railroads on October 1, 1926, as compared with 90,052 in October, 1920. The study was made at the suggestion of the Women's Bureau of the Department and shows that women were employed in almost every branch of the railroad work, including two in train service and 290 in shop work. Of those in the latter classification, however, 203 were in clerical positions. Other classifications list 29 as draftswomen and assistants, 193 as crossing watchwomen, of whom 176 were on day work and 17 on night work, while 10 were employed as pumpers.

The Interstate Commerce Commission has postponed the effective date of its order prescribing a system of depreciation accounting for steam railroads from January 1, 1928, to January 1, 1929. The commission announced that it took this action because it had reason to believe that the very extensive preliminary work necessary on the part of the carriers before the new plan of accounting is established could not be accomplished prior to January 1, 1928, and also in order to afford time for the consideration of a petition for rehearing and reconsideration of certain aspects of the order which the carriers have given notice that they intend to file in the near future.

An arbitration board has awarded a wage increase of 5½ per cent to crossing tenders, drawbridge tenders, pumpmen and lampmen on the Boston & Maine, the decision affecting 950 men. Benjamin Thomas, the member of the board representing the railroad, dissented from the award on the ground that it was not in accord with the evidence and that the Boston & Maine rates for the positions under consideration were already higher than those of all but one of its connections. Mr. Thomas, in a minority report, said that the evidence showed conclusively that the cost of living has not increased since the last change of wages of this class of employees, and the conclusion seems inevitable that the application of arbitration under the present railroad labor act is being regarded as synonymous with compromise.

Railway ties to the number of 3,760,613, valued at $3, 507,629 were exported from the United States in 1926, according to the lumber division of the Department of Commerce. This is about 3 per cent of the total production and is somewhat above the average for the past five years. Hardwood ties, which play a small part in the export trade, are shipped principally to Canada and Mexico, while of the softwoods, Douglas fir and Southern pine ties, treated and untreated, are exported in about equal quantities. Treated softwood ties are shipped principally to the West Indies and Central America, from one-half to two-thirds of the total moving through the port of New Orleans, while most of the remainder are furnished by Oregon and Washington. California, with redwood, leads in the exports of untreated softwood ties, Washington and New Orleans following.

Personal Mention

General

R. H. Gilkey, supervisor of bridges and buildings on the Central of Georgia, with headquarters at Savannah, Ga., has been promoted to superintendent of that road's creosoting plant at Creosote, Ga., succeeding **L. H. Harper,** who has left the service of that company.

Cecil Ewart, division engineer of the Saskatoon division of the Canadian National, with headquarters at Saskatoon, Sask., has been promoted to commissioner of industries for the Western region, with headquarters at Winnipeg, Man. Mr. Ewart was born on January 27, 1877, at Dinant, France, of English parents and entered railway service in 1898, as a chainman on construction on the Canadian Pacific in western Canada, being advanced successively to transitman and resident engineer. In 1904, he entered the service of what is now the Canadian National as a transitman on the Peace river surveys through the mountains and later was promoted to resident engineer on construction west of Saskatoon, Sask. He joined the Canadian Expeditionary Force in 1915 and went overseas in 1916 as a lieutenant, being transferred to the Canadian railway troops in 1917, where he was subsequently promoted to major. He returned to the Canadian National in 1919, since which time he has served as resident engineer and division engineer on construction and maintenance until his recent promotion to commissioner of industries for the Western region.

R. W. Cattermole, superintendent and chief engineer of the Tonopah & Goldfield, with headquarters at Goldfield, Nev., has been promoted to general superintendent, with headquarters at the same place. Mr. Cattermole was born in 1872 at Ft. Madison, Iowa, and entered railway service in 1891 as a rodman on the Chicago, Ft. Madison & Des Moines (now a part of the Chicago, Burlington & Quincy), later being advanced to instrumentman. He was out of railway service from 1893 to 1897, when he returned to the C. Ft. M. & D. M. in charge of surveys. From 1907 to 1911 he was engaged in surveys and was resident engineer on the Burlington in Iowa. In 1902 he became a roadmaster on the Wisconsin Central (now a part of the Minneapolis, St. Paul & Sault Ste. Marie) and later in the same year was made superintendent of bridges and buildings. In 1904 he was promoted to division engineer, with headquarters at Abbotsford, Wis., and in 1908 was further advanced to engineer maintenance of way of the Wisconsin Central and the Soo Line, with headquarters at Chicago. In 1910, he became chief engineer of the Tonopah & Goldfield, later assuming also the duties of superintendent, which position he was holding at the time of his recent promotion to general superintendent.

R. R. Bragg, division engineer on the El Paso-Amarillo division of the Chicago, Rock Island & Pacific, with headquarters at Dalhart, Tex., whose promotion to trainmaster, with headquarters at the same place, was noted in the May issue, was born on September 9, 1885, at Greenfield, Ind., and was educated at Purdue University. He entered railway service in January, 1906, as a rodman on track elevation work on the Vandalia (now a part of the Pennsylvania) at Indianapolis, Ind., and was promoted successively to instrumentman and resident engineer. From January, 1908, to January, 1909, he was engaged in contracting work with the James Stewart Company and others at St. Louis, Mo., and from this latter date to January, 1910, was office engineer for George Townsend, who built the Kansas City & St. Joseph Electric railway. He entered the service of the Rock Island on January 1, 1910, as an assistant engineer, with headquarters at Topeka, Kan., and was transferred to Fairbury, Neb., on May 1, 1913. He was promoted to division engineer of the St. Louis division, with headquarters at Eldon, Mo., on April 1, 1917, and on September 1, 1918, was transferred to the El Paso-Amarillo division, with headquarters at Dalhart, Tex., which position he was holding at the time of his recent promotion to trainmaster.

Harry G. Clark, assistant to the president of the Chicago, Rock Island & Pacific, and an engineer by training and experience, has been elected vice-president, with headquarters at Chicago, to perform such special duties as may be assigned to him by the president. Mr. Clark was born on July 8, 1875, at Leavenworth, Kan., and was educated at the University of Kansas, where he graduated in 1898. He entered railway service as a chainman on the Kansas lines of the Atchison, Topeka & Santa Fe, and in 1899 become a rodman on construction on the Chicago, Burlington & Quincy, later being promoted to transitman on location surveys for double track in Iowa. In 1900 Mr. Clark became a resident engineer on the Choctaw, Oklahoma & Gulf (now a part of the Rock Island) and later was successively division engineer of the Panhandle and Arkansas divisions of the Rock Island, and district engineer of the Choctaw district. He entered the operating department in October, 1909, where he acted as trainmaster on the Arkansas and Oklahoma divisions. In 1912 he was promoted to assistant to the vice-president, in charge of maintenance. During the war he served as chief engineer from September, 1918, to July, 1919, and was then appointed assistant to the president, which position he was holding at the time of his recent promotion to vice-president.

Harry G. Clark

Engineering

William Mahan, superintendent of bridges and buildings on the Wheeling & Lake Erie, with headquarters at Brewster, Ohio, has been assigned to special work in connection with depreciation and valuation, with headquarters at the same place.

C. R. Adsit, assistant division engineer on the Baltimore & Ohio, with headquarters at Garrett, Ind., has been promoted to acting division engineer of the Cincinnati, Indianapolis & Western (controlled by the B. & O.) with headquarters at Indianapolis, Ind., to succeed **H. F. Passel,** who has been assigned to valuation work temporarily.

Ronald McIsaac has been appointed division engineer of the New Glasgow division of the Atlantic region of the Canadian National, with headquarters at New Glasgow, N. S., to succeed **G. W. H. Perley,** who has been transferred to the Campbellton division, with headquarters at Campbellton, N. B., where he replaces **L. H. Robinson,** who in turn has been transferred to the Halifax division, with headquarters at Halifax, N. S., where he succeeds **R. A. Black,** who has been transferred. **F. W. Leeper,** division engineer, with headquarters at Prince Rupert, B. C., has been transferred to the Saskatoon division, with headquarters at Saskatoon, Sask., to succeed **Cecil Ewart,** whose promotion to commissioner of industries on the Western region is noted elsewhere in this issue.

Frank C. Shepherd, chief construction engineer of the Boston & Maine, whose promotion to consulting engineer of the Boston & Maine was noted in the May issue, was born in 1870 at Gloucester, Mass., and was educated at the Massachusetts Institute of Technology. He entered railway service in 1902 as a resident engineer on the New York Central, with headquarters at New York, leaving the service of that road in 1906. H became engineer of construction on the Boston & Maine in 1912 and was appointed valuation engineer in 1914, remaining in that position until 1917 when

he was made principal assistant engineer. He was promoted to assistant chief engineer in 1920 and was further advanced to chief construction engineer in 1926, which position he was holding at the time of his recent appointment as consulting engineer.

Porter Allen, superintendent of the Eastern division of the Central region of the Pennsylvania, with headquarters at Pittsburgh, Pa., has been promoted to chief engineer maintenance of way of the Western region, with headquarters at Chicago, to succeed **W. L. Ekin,** who died on April 28. Mr. Allen was born at Williamsport, Pa., in 1880 and was educated at Lafayette University. He entered railway service in 1902 as a rodman on the Pennsylvania and served on various divisions in that capacity and as transitman and supervisor. In 1920 he was promoted to engineer of the Cleveland & Pittsburgh division, with headquarters at Cleveland, Ohio, and in 1923 entered the operating department as superintendent of the South Bend division, being transferred to the Norfolk division in 1924. He was made superintendent of the Eastern division of the Central region in September, 1926, and was holding this position at the time of his recent promotion to chief engineer maintenance of way of the Western region.

J. P. Mack, whose promotion to division engineer on the Los Angeles & Salt Lake unit of the Union Pacific System, with headquarters at Los Angeles, Cal., was noted in the April issue, was born on February 18, 1881, at Silver City, Nev., and was educated at the University of Nevada. He entered railway service in 1903 as a draftsman on the Western Pacific. From 1904 to 1906 he was a clerk and extra gang foreman on the Southern Pacific, returning to the Western Pacific in the latter year as a transitman. From April, 1909, to January, 1910, he was a transitman and assistant engineer on location and valuation on the Oregon Short Line, and on the latter date he became an assistant engineer on the Los Angeles & Salt Lake on location and construction in the Meadow Valley wash. In January, 1912, he returned to the Oregon Short Line as an assistant engineer on location and construction, remaining in that position until May, 1916, when he returned to the Los Angeles & Salt Lake, with which road he has since been connected with the exception of the period from May, 1918, to August, 1919, when he was in military service overseas. From August, 1919, to May, 1922, he was an assistant engineer and locating engineer on various locations. On the latter date he became an assistant engineer on the construction of the Santa Ana branch, following which he was engaged in construction work involving grade separation and yard changes in Los Angeles, which position he was holding at the time of his recent promotion to division engineer.

F. S. Hewes, division engineer on the Panhandle & Santa Fe, a subsidiary of the Atchison, Topeka & Santa Fe, has been promoted to office engineer in the office of the chief engineer of the system, with headquarters at Chicago, to succeed **J. de N. Macomb,** who has been appointed assistant to the vice-president in charge of railroad sales of the Inland Steel Company. **Thomas Blair,** assistant engineer on the construction of second track at Amarillo, Tex., has been promoted to division engineer to succeed Mr. Hewes.

Mr. Hewes was born in Payson, Ill., in 1884, and graduated from the University of Illinois in 1906. He entered railway service in the summer of 1905 as a rodman on construction on the Santa Fe at Belen, Tex., and after the completion of his college course became a rodman on maintenance on the Chicago & North Western at Escanaba, Mich. In August, 1907, he became a draftsman on the Santa Fe at Amarillo, Tex., with which railroad he has been connected since that time. He was promoted to transitman on location at Coleman, Tex., in April, 1909, and afterwards served as draftsman, resident engineer and assistant engineeer on construction in Texas, New Mexico and Arizona until November, 1913, when he was granted a leave of absence on account of illness. On his return to duty in August, 1914, he was made masonry inspector on maintenance, with headquarters at Florence, Kan., serving in this capacity until February, 1915, when he became a transitman on location and construction, and later office engineer at Cushing, Okla. In October, 1915, Mr. Hewes entered the valuation department as an assistant engineer and in November of the same year became a pilot engineer on the lines in Texas. He was promoted to assistant valuation engineer, with headquarters at Amarillo, Tex., in July, 1916, and served in this capacity until February, 1922, when he was promoted to division engineer on maintenance, with headquarters at San Marcial, N. M. In December, 1924, he was transferred to the Panhandle & Santa Fe, with headquarters at Slaton, Tex., where he was located at the time of his recent promotion to office engineer in the office of the chief engineer of the system at Chicago.

Eric Gustaf Ericson, assistant to the chief engineer of the Pennsylvania system, with headquarters at Pittsburgh, Pa., retired on May 31, in accordance with the rules of that road, after nearly 44 years continuous service. Mr. Ericson was born on May 7, 1857, at Ramdala, Sweden, and was educated at the Royal Polytechnical Institute at Stockholm, where he graduated in June, 1880, following which he was for two years in charge of harbor improvements and engaged in surveys for canal projects and for one year resident engineer in charge of the location and construction of a railroad on the west coast of Sweden. On September 1, 1883, shortly after coming to America, Mr. Ericson entered the service of the Pennsylvania as a draftsman and transitman in the office of the chief engineer at Pittsburgh, Pa. In April, 1886, he was promoted to supervisor on the Pittsburgh, Ft. Wayne & Chicago, (now a part of the Pennsylvania), with headquarters at Wooster, Ohio, and on July 1, 1890, was promoted to engineer maintenance of way of the Cincinnati & Muskingum Valley (now a part of the Pennsylvania), with headquarters at Zanesville, Ohio, being transferred on July 1, 1893, to the Western division of the P. Ft. W. & C., with headquarters at Ft. Wayne, Ind. On January 1, 1901, Mr. Ericson was promoted to assistant engineer in charge of construction and maintenance in the office of the chief engineer of the Pennsylvania Lines West of Pittsburgh, and two years later was further promoted to principal assistant of the Northwest region. During the period of federal control from 1917 to 1920 he was principal assistant engineer-construction of the lines west of Pittsburgh and had direct responsibility, under the chief engineer of construction, for the large construction program then carried on. In 1920, after the consolidation of the lines east and west of Pittsburgh, he was promoted to assistant to the chief engineer of the system, with headquarters at Pittsburgh, Pa., remaining in this position until the time of his retirement on May 31.

Eric Gustaf Ericson

Track

M. O. Woodrow has been appointed assistant supervisor on Division 5 of the Long Island Railroad, succeeding **C. J. Henry,** who has been transferred to Division 1 to take the place of **F. H. Bensch** who is on leave of absence.

W. F. Shepherd has been appointed district roadmaster on the Wheeling & Lake Erie in charge of District No. 3, Toledo division, with headquarters at Brewster, Ohio, succeeding **W. L. Peoples,** whose promotion to superintendent of bridges and buildings is noted elsewhere.

V. H. Carruthers, roadmaster on the Kettle Valley, with headquarters at Penticton, B. C., has been appointed roadmaster on the Canadian Pacific, with headquarters at Wey-

burn, Sask., to succeed **Patrick O'Connell,** notice of whose death appears elsewhere in this issue.

H. B. Shoemaker, an engineer in the valuation department of the New York Central west of Buffalo, has been appointed assistant superintendent and supervisor on the Valley branch, with headquarters at Dunkirk, N. Y., succeeding **F. W. Watkins,** deceased, in the latter capacity.

John B. Mooney, section foreman on the Great Northern at Menahga, Minn., has been promoted to district roadmaster on the Fourth district, with headquarters at Barnesville, Minn., to take the place of Hans Forberg, who has been granted a 60-day leave of absence on account of sickness.

Franks Ades, acting roadmaster on the Saskatoon division of the Canadian Pacific, with headquarters at Lanigan, Sask., has been appointed roadmaster on the same division, with headquarters at Strasbourg, Sask., to succeed **A. J. Swanson,** resigned. **J. Stewart,** roadmaster on the Saskatoon division, with headquarters at Lanigan, who has been on leave of absence, has resumed his duties.

W. K. Tate, assistant engineer on the Nashville, Chattanooga & St. Louis, has assumed the duties as supervisor on the McMinnville branch, with headquarters at Tullahoma, Tenn., in addition to his engineering duties in the place of **N. O. Stone,** who had his headquarters at Sparta, Tenn., and who has been transferred to Fayetteville, Tenn., to succeed **R. A. Easley,** notice of whose death appears elsewhere in this issue.

John Fyalko, whose promotion to roadmaster on the Chicago, Burlington & Quincy, was noted in the May issue, was born on October 27, 1873, in Austria, and entered railway service with the Burlington on June 1, 1891. He was promoted to section foreman on April 17, 1897, and to extra gang foreman in 1902. In 1918 he was made yard foreman at Streator, Ill., which position he was holding at the time of his recent promotion to roadmaster.

Ray Sherman, section foreman on the Missouri-Kansas-Texas, has been promoted to acting roadmaster, with headquarters at Waco, Tex., to succeed **Frank Smith,** who has been appointed general foreman in charge of the rock crusher at Sweeney, Mo., for the season. **Frank L. Gillian,** yard foreman at North McAlester, Okla., has been appointed acting roadmaster, with headquarters at the same place, to succeed **G. L. Moody,** who has been appointed general foreman in charge of rail laying on the St. Louis division.

Harry L. Fisher, whose promotion to supervisor on the Illinois Central, with headquarters at Carbondale, Ill., was noted in the May issue, was born on November 19, 1895, at Makanda, Ill., and entered railway service as a track laborer on the Illinois Central on August 18, 1914. He was promoted to section foreman on November 15, 1922, and to extra gang foreman on November 27 of the same year, which position he was holding at the time of his recent promotion to supervisor.

W. N. Patterson, whose promotion to roadmaster on the St. Louis-San Francisco, with headquarters at Chaffee, Mo., was noted in the April issue, was born in Missouri 43 years ago and entered railway service as a section laborer on the St. Louis Southwestern at the age of 18. He later entered the service of the St. Louis-San Francisco and was promoted to section foreman in 1907. Mr. Patterson was an extra foreman on the Cape Girardeau Northern for a period of about six months and returned to the Frisco in December, 1913, in whose service he has since remained, in the capacity of section, extra gang and yard foreman and also as a relief roadmaster at various times, until the time of his recent promotion to roadmaster.

T. E. Casteel, whose promotion to roadmaster on the Chicago, Burlington & Quincy, with headquarters at Albany, Mo., was noted in the May issue, was born on February 2, 1876, at Rome, Iowa, and entered railway service in the track department of the Burlington in October, 1891. He was promoted to section foreman on July 1, 1899, and to extra gang foreman in November, 1900, serving in this capacity until 1911, when he was further promoted to general foreman at Beardstown, Ill. In October of the same year he was promoted to roadmaster on the Centerville division, with headquarters at Centerville, Iowa, and in 1917 was transferred to the Hannibal division, with headquarters at Hannibal, Mo. In August, 1921, owing to ill-health, he was granted a furlough to act as yard foreman at St. Joseph, Mo., where he remained until his recent promotion to roadmaster.

C. W. Russell has been appointed acting supervisor on the Richmond division of the Southern, with headquarters at Keysville, Va., to replace **B. F. Cary,** whose appointment as bridge and building supervisor, with headquarters at Alexandria, Va., is noted elsewhere in this issue. **W. H. Wood,** resident engineer at Chattanooga, Tenn., has been appointed supervisor, with headquarters at Knoxville, Tenn., to succeed **W. C. Kidwell,** who has been transferred to Coal Creek, Tenn., to take the place of **A. Lyon,** who in turn has been transferred to Cleveland, Tenn., to succeed **W. T. Dobyns,** deceased. **C. G. Smith,** extra gang foreman, has been appointed supervisor on the Danville division, with headquarters at Greensboro, N. C., succeeding **C. C. Fowlkes,** who has been assigned to other duties. Mr. Wood was born on January 26, 1894, at Bristol, Va., and was educated at the University of Tennessee. On June 1, 1916, he entered the service of the Southern as a junior engineer, with headquarters at Knoxville, Tenn., and in 1920 he was further promoted to resident engineer in charge of the work on the new yards at Asheville, N. C., and shortly after was transferred to Chattanooga, Tenn., where he was in charge of the construction of the Citico yards, which position he was holding at the time of his recent promotion to supervisor.

J. E. Vandling, assistant supervisor on the Philadelphia Terminal division of the Pennsylvania, with headquarters at West Philadelphia, Pa., has been promoted to supervisor on the Baltimore division, with headquarters at York, Pa., succeeding **E. R. Parker,** transferred to the Philadelphia division, with headquarters at LeMoyne, Pa., replacing **J. F. Swenson,** transferred to Lancaster, Pa., on the same division to succeed **J. C. Poffenberger,** who in turn has been transferred to the Philadelphia Terminal division to take the place of **G. H. Stewart,** transferred to the office of the chief engineer maintenance of way. **C. R. Wilson,** assistant on engineer corps on the Eastern Pennsylvania division has been promoted to assistant supervisor on the Trenton division, with headquarters at Phillipsburg, N. J., to succeed **A. H. Whisler,** transferred to the Middle division, with headquarters at Newport, Pa., to take the place of **E. L. McNeal,** who has been transferred to the Philadelphia Terminal division, with headquarters at West Philadelphia to succeed Mr. Vandling. **J. L. Cranwell,** assistant engineer on engineer corps on the Southern division, has been promoted to assistant supervisor on the Middle division, with headquarters at Hollidaysburg, Pa., to succeed **J. D. Morris,** who has been transferred to Jersey City, N. J., to take the place of **R. W. Sheffer,** transferred to the Middle division, with headquarters at Huntingdon, Pa. **W. L. Pedrick,** assistant on engineer corps on the New Jersey division, has been promoted to assistant supervisor on the Baltimore division, with headquarters at Parkton, Md. **D. M. Clarke,** assistant on the engineer corps on the Cleveland & Pittsburgh division of the Pennsylvania, with headquarters at Cleveland, Ohio, has been promoted to assistant supervisor on the Allegheny division with headquarters at Oil City, Pa., to succeed **A. R. DeWalt,** who has been transferred to the Pan Handle division with headquarters at Newcomerstown, Ohio. **D. H. Roberts,** assistant on the engineering corps on the Pan Handle division with headquarters at Pittsburgh, Pa., has been promoted to assistant supervisor on the Renovo division, with headquarters at Renovo, Pa.

Bridges and Buildings

W. L. Peoples, district roadmaster on the Toledo division of the Wheeling & Lake Erie, with headquarters at Brewster, Ohio, has been appointed superintendent of bridges and buildings with headquarters at the same place, succeeding

William Mahan whose assignment to special depreciation work is noted elsewhere in this issue.

B. F. Carey, track supervisor on the Richmond division of the Southern, with headquarters at Keysville, Va., has been appointed bridge and building supervisor on the Washington division, with headquarters at Alexandria, Va., **G. W. Welker** has been appointed assistant bridge and building superintendent at the same place, succeeding **C. B. Harris,** who has been assigned to other duties.

Purchasing and Stores

A. E. Owen, assistant purchasing agent of the Pennsylvania, with headquarters at Chicago, has been appointed also purchasing agent of the Chicago Union Station Company, Chicago, succeeding **W. G. White, Sr.,** who will continue in his capacity as secretary.

E. A. Workman, stores manager on the Central of New Jersey, with headquarters at New York, has been promoted to manager of purchases and stores, a newly created position due to the consolidation of the purchasing and stores departments. **C. B. Williams,** purchasing agent, with headquarters at New York, has been granted an indefinite leave of absence on account of ill health.

Obituary

W. T. Dobyns, supervisor on the Southern, with headquarters at Cleveland, Tenn., died on April 20.

William White, formerly roadmaster on the Chicago & North Western, with headquarters at Belvidere, Ill., who retired on November 1, 1925, after a continuous service of over 53 years with that road, died at his home at Belvidere on May 2, at the age of 71 years.

Ralph A. Easley, supervisor on the Nashville, Chattanooga & St. Louis, with headquarters at Fayetteville, Tenn., died at a hospital at Lewisburg, Tenn., on April 10, as the result of being run over by a freight train at that place. Mr. Easley was 64 years of age and had been in the service of the N. C. & St. L. for 43 years.

Patrick O'Connell, roadmaster on the Canadian Pacific, with headquarters at Weyburn, Sask., died at Stoughton, Sask., on April 24, as a result of injuries received when the motor car on which he was riding was derailed. Mr. O'Connell had been in the employ of the Canadian Pacific for 25 years and had been roadmaster at Weyburn for the last 8 years.

O. M. Patterson, roadmaster on the St. Louis division of the Missouri-Kansas-Texas, with headquarters at Mokane, Mo., died on April 9 at the M-K-T Hospital at Parsons, Kan., as the result of injuries received in the derailment of a motor car near McKittrick, Mo., on March 29. Mr. Patterson was 54 years of age and had been stationed at Mokane for the last three years, prior to which time he had been roadmaster at Parsons, Kan., for four years.

Ernest Stenger, formerly general superintendent of the Union Pacific and an engineer by training and experience, died on May 28 at Denver, Colo., after a short illness from pneumonia. Mr. Stenger was born in 1865 at Colmar, Alsace, France, coming to Columbus, Neb., at the age of six years. He graduated at the University of Michigan in 1886 and entered railway service in the same year as a rodman on the Burlington & Missouri River in Nebraska (now a part of the Chicago, Burlington & Quincy). He became a draftsman on the Atchison, Topeka & Santa Fe in 1888 and two years later became an assistant engineer on the Missouri Pacific. Mr. Stenger was appointed a division engineer on the Union Pacific in 1900 and later entered the operating department, serving as assistant superintendent and superintendent. In 1907, he was appointed a general superintendent on the Rio Grande Western (now a part of the Denver & Rio Grande Western) and in March, 1911, he became general manager of the St. Joseph & Grand Island and the St. Joseph Terminal, with headquarters at St. Joseph, Mo. He was later made general superintendent of the Union Pacific at Omaha, Neb., remaining in that position until 1920 when he left railway service to become receiver and treasurer of the Denver Tramway Company. With the reorganization of that company he was elected president and served in that capacity and as president of the Denver & Intermountain until the time of his death.

William S. Dawley, consulting engineer at St. Louis, Mo., and formerly chief engineer of the Chicago & Eastern Illinois, died suddenly on May 18. Mr. Dawley was born on November 26, 1856, at Stockton, Wis., and graduated from the University of Minnesota in 1879. In the same year he entered railway service as a rodman on construction of the Minneapolis & St. Louis, and was subsequently advanced to assistant engineer. He was engaged in surveying on the St. Paul, Minneapolis & Manitoba (now the Great Northern) and the Minneapolis, Sault Ste. Marie & Atlantic (now the Minneapolis, St. Paul & Sault Ste. Marie) in 1883 and later was appointed locating engineer on the Wisconsin, Minnesota & Pacific (now the Chicago Great Western). From 1885 to May, 1894, Mr. Dawley served as locating engineer and assistant engineer in charge of construction on the Chicago & Eastern Illinois, and on the latter date he was appointed chief engineer. He served in this capacity and as engineer of maintenance of way, performing the duties of chief engineer, until 1906 when he was appointed chief engineer of the Missouri & North Arkansas, with headquarters at St. Louis. Mr. Dawley became chief engineer of the Yunnan-Szechuan & Tengyueh Railway in Southwestern China in 1909. There he made location surveys for a seaport connection for Yunnan Fu, (Yunnan Province,) and for a line north from Canton. On his return to the United States in 1913 Mr. Dawley became associated with Bion J. Arnold in the preparation of a report on the steam railroads of Chicago. Following this work he made surveys used as the basis of terminal improvements at Flint, Mich., and in 1917 he was again associated with Mr. Arnold in a study of the Baltimore, Md., terminals. At the time of his death he was engaged on valuation work for the Missouri & North Arkansas. Mr. Dawley was the first treasurer of the American Railway Engineering Association, serving in that capacity from 1899 to 1909.

William L. Ekin, chief engineer maintenance of way of the Western region of the Pennsylvania, with headquarters at Chicago, whose death from heart failure on April 28, was noted briefly in the May issue, was born on September 18, 1879, at Xenia, Ohio. He was educated at the Ohio Wesleyan University and the Case School of Applied Science and after completing his college courses, entered railway service on July 16, 1900, in the maintenance of way department of the Cincinnati division of the Pennsylvania. After holding various positions on the Cincinnati division he became an assistant engineer on the Michigan division of the Vandalia, (now a part of the Pennsylvania) in September, 1905. He was promoted to division engineer of the same division on May 1, 1907, and was transferred to the St. Louis division on July 1, 1913. Mr. Ekin entered the operating department on February 11, 1918, as superintendent of the Peoria division and was transferred successively to the Michigan, the Conemaugh and the Philadelphia divisions until October 24, 1924, when he was promoted to general superintendent of the Northern division. Early the following year he was appointed superintendent of the Philadelphia division and on April 1, 1926, he was promoted to chief engineer maintenance of way of the Western region, which position he was holding at the time of his death.

William L. Ekin

Construction News

The Birmingham Southern has been authorized to construct an extension from Ensley through Pratt City to Thomas, a distance of 2.4 miles, all within the corporate limits of the city of Birmingham, Jefferson County, Ala. The estimated cost of construction is $301,240.

The Canadian National has awarded a contract for the construction of a passenger station at Edmonton, Alta., to the Permanent Construction Company, Edmonton, at a cost of about $500,000.

The Chicago & Alton has closed bids for the revision of 5 miles of line at Macoupin, Ill., to reduce the grade on the northbound main track, and for the construction of 3 miles of second main track, involving the moving of 500,000 cu. yd. of earth and an expenditure of $400,000.

The Chicago & North Western has awarded a contract to John Marsch, Chicago, for the construction of the Wiscona connecting line north of Milwaukee, Wis., 1.5 miles long, which will eliminate the present line through White Fish Bay, Wis., and Shorewood. The concrete structures required will be built by Henry Danischefsky, Milwaukee. The entire project will involve an expenditure of about $1,500,000 and has been undertaken at the urgent request of the two municipalities, which objected to the operation of the railroad through their limits.

The Chicago, Burlington & Quincy will use company forces in the construction of a second main track between Diamond Bluff, Wisconsin, and the North Western crossing, two miles north of East Winona, 13 miles. A contract for grading for portions of this second track has been let to the LaCrosse Dredge Company, LaCrosse, Wis. Under this contract material for grading will be dredged from the Mississippi river. The cost of the entire project is estimated at $2,300,000.

The Chicago, Rock Island & Pacific has awarded a contract to the Ogle Construction Company, Chicago, for the construction of a two-track electric cinder pit at Armourdale, Kan.

A contract for the construction of a water-treating plant at Marion, Kan., having a capacity of 500 gal. per min. has been let to the Railroad Water and Coal Handling Company, Chicago, at a cost of about $30,000.

The Great Northern has awarded a contract to Guthrie & Co., of St. Paul, Minn., for the construction of a cut-off between Winton, Wash., and Leavenworth, via Plain, at a cost of about $4,000,000. This project, which is planned for completion simultaneously with the Cascade tunnel on October 30, 1928, involves the driving of three tunnels and the bridging of the Wenatchee river. South of Plain the route will follow the Chumstick creek.

The Denver & Rio Grande Western has awarded a contract to J. Fred Roberts & Sons Construction Company, Denver, Colo., for a change of alinement for a distance of 6,800 ft. on the Pueblo division near Husted, Colo., which is to be completed by August, 1927. A contract for the grading and concrete construction in connection with the line revision on the Grand Junction division, between Minturn, Colo., and Eagle, 26 miles, has been let to the Morrison-Knudsen Company, Boise, Idaho, at an approximate cost of $423,500. Another contract has been awarded to the List Construction Company, Kansas City, Mo., for the grading and concrete construction in connection with the line revision between Brown Canon, Colo., and Buena Vista, on the Salida division, 3 miles, at an estimated cost of $210,000. A contract has been let to E. W. Wright, Grand Junction, Colo., for grading in connection with the re-arrangement of tracks at 13 points between Chacra, Colo., and Green River, Utah.

A water treating plant will be installed for this company at Pueblo, Colo., by the Stearns-Roger Manufacturing Company, Denver, Colo., at an estimated cost of $30,000.

The Detroit, Toledo & Ironton has awarded a contract to the Handysite Construction Company, Detroit, Mich., for the construction of culverts and grade separation structures in the vicinity of Napoleon, Ohio, and Malinta, on the line of the cut-off between Malinta, Ohio, and Durban, Mich., at an approximate cost of $500,000.

The Gulf Coast Lines have been authorized by the Interstate Commerce Commission to build two branch lines in the lower Rio Grande valley, one extending eastward from Fernando, Tex., about 6 miles, and the other extending eastward from San Benito about 18 miles.

The Lehigh Valley has been ordered by the New Jersey Board of Public Utility Commissioners to eliminate a grade crossing of a state highway with its line in Hillsboro township; estimated cost approximately $324,000.

The New York Central plans work at Port Clinton, Ohio, which will include the construction of a cut-off about two miles long and the elevation of its tracks in the village of Port Clinton. The new line will be about 1,500 ft. shorter than the old one and will eliminate a curve which necessitates reduction of speed. The cost of the work, which it is expected will be completed in 1928, will be approximately $2,000,000.

The Northern Pacific has been authorized by the Interstate Commerce Commission to construct an extension from a point near Glendive, Mont., to Circle, Mont., and Brockway, approximately 62 miles. In its decision the commission denied the application of the Montana Eastern, a subsidiary of the Great Northern to build from Richey, Mont., to Circle, 33 miles, and from Circle to Brockway, 12 miles.

A contract has been let to Morrison & Knudson, Boise, Idaho, for the rebuilding of the line between Arrow, Idaho, and Oro Fino, 29 miles, at an estimated cost of $400,000.

The Oregon, California & Eastern has been granted an extension of time by the Interstate Commerce Commission from May 3 to June 17 for the beginning of construction of new lines proposed by this company and the Central Pacific in southern Oregon which were authorized conditionally by the commission in a certificate dated May 3, 1926.

The Oregon Trunk has been authorized by the Interstate Commerce Commission to build a line from Bend, Ore., to Klamath Falls, by way of Paunina, subject only to the unconditional acceptance by that road and its agreement to begin construction within 60 days and to complete it within two years.

The Pennsylvania has awarded a contract to Henry Steers, Inc., New York, for filling for the approaches and yard leading to the proposed Newark Bay bridge between Waverly yard and Greenville yard, N. J.

The company has placed in the hands of the mayor of Newark, N. J., its plans for improvements in that city, including the construction of a new passenger station on the north side of its tracks between Market and Canal streets. On the completion of the new facilities, Manhattan Transfer, where connection is made with Hudson tunnel trains to downtown New York, will be abandoned.

The Quanah, Acme & Pacific has awarded a contract to the Lone Star Construction Company, San Antonio, Tex., for grading, bridging and track laying on the extension between McBain, Tex., and Floydada, which includes 27 miles of line and 2½ miles of siding. Bids will be taken later for the construction of stations, buildings and telegraph lines, and the entire project is estimated to involve the expenditure of $1,132,000.

The Southern Pacific, through its subsidiary, the San Antonio & Aransas Pass, has been authorized by the Interstate Commerce Commission to build an extension from Harlingen, Tex., to Brownsville, about 30 miles.

The Temiskaming & Northern Ontario has awarded a contract to Angus & Taylor, North Bay, Ont., for constructing the extension of that road into the Rouyn region of Quebec. The contract calls for 27 miles of grading, ballasting and rail laying to be completed in November.

The Wabash has awarded a contract to the P. J. Hannan Company, St. Louis, Mo., for the construction of a steel and concrete viaduct over Vandeventer avenue at Market street, St. Louis.

Supply Trade News

General

The American Steel & Wire Company has awarded a contract to Ben Wright for the construction of a warehouse 100 ft. by 150 ft. at Anderson, Ind.

The Adams & Westlake Company has awarded a contract to the Ralph Sollitt & Sons Construction Company for the construction of a one and two-story plant at Elkhart, Ind.

The Joseph Dixon Crucible Company, Jersey City, N. J., has completed 100 years existence, having been founded by Joseph Dixon at Salem, Mass., in 1827.

The new dynamite plant of the **E. I. du Pont de Nemours & Co.,** at Mineral Springs, Ala., near Birmingham, was placed in operation on May 16. The plant has an annual capacity of 15,000,000 lbs.

The Anchor Post Fence Company, New York, has awarded a contract to the Austin Company, Cleveland, for the construction of a new manufacturing plant at Baltimore, Md., to be located near Sparrows Point. The first unit to be erected will be a one-story steel and concrete building, 200 ft. wide by 500 ft. in length.

The Kentucky Rock Asphalt Company, Louisville, Ky., is not considering the merging of its properties with those of other rock asphalt companies, according to a statement issued by W. H. Tarvin, president of that company. Mr. Tarvin states that his company owns about 45,000 acres of asphalt rock ledges, sufficient for its needs for many years and that it, therefore, has no interest in a consolidation with other properties.

Personal

Walter L. Graser, sales engineer of the Truscon Steel Company, with headquarters at Omaha, Neb., has been appointed manager of the Tulsa, Okla., office.

John A. Coakley, assistant to the vice-president of the American Steel & Wire Company, has been appointed general traffic manager, with headquarters at Cleveland, Ohio.

E. B. Yancey has been appointed manager, and **H. O. Thayer,** assistant manager of the new dynamite plant of the E. I. du Pont de Nemours & Co., at Mineral Springs, Ala.

Harry L. Shepard, formerly associated with the department of the chemist and engineer of tests of the Union Pacific, has been appointed technical representative of the Reading Iron Company, Reading, Pa., in the Chicago territory.

E. R. Wyler, who has been connected with the Cleveland, Ohio, sales branch of the Independent Pneumatic Tool Company, has been transferred to the sales department at the general offices in Chicago and will have his headquarters at St. Paul, Minn.

S. T. Kiddoo, formerly chairman of the board of the Stockyards National Bank and the Stockyards Trust and Savings Bank has been elected vice-president and treasurer of Fairbanks, Morse & Co. **William C. Heath,** manager of the manufacturing division, has been elected vice-president in charge of manufacturing.

T. F. Carlin, who has been connected with the sales department of the Louisville Frog & Switch Company, Louisville, Ky., for the past eight years, has been promoted to eastern sales manager, with headquarters at 631 Pennsylvania avenue, N. W., Washington, D. C. Mr. Carlin was associated with the Southern Railway for a number of years prior to his entering the service of the Louisville Frog & Switch Company.

Edward Everett Ayer, one of the organizers of the Ayer & Lord Tie Company, of which he was director, died on May 3 at Pasadena, Cal., following an operation. Mr. Ayer was born on November 16, 1841, at Kenosha, Wis., and at the age of 19 crossed overland to the Pacific coast. He was the first man in California to be sworn into the service in the Civil War, in which he served in California, Arizona and New Mexico. He afterwards engaged in merchandising at Harvard, Ill., and about 1867 began the operation of a sawmill at Flagstaff, Ariz. About 10 years later he organized the Ohio Valley Tie & Lumber Company at Chicago and in 1893, together with John B. Lord, he organized the Ayer & Lord Tie Company of which he was a director to the time of his death. Mr. Ayer retired from active business in 1914 to travel in this country and abroad, and since 1919 spent the greater part of his time in California.

D. B. Hussey, vice-president and secretary of the Hussey-Hobbs Tie Company, St. Louis, Mo., of which he was the founder, died on May 13 at St. Louis after a lingering illness, at the age of 63.

J. de N. Macomb, office engineer on the Atchison, Topeka & Santa Fe at Chicago in Charge of rail specifications, requirements and investigations, has been appointed assistant to the vice-president in charge of railway sales of the Inland Steel Company, Chicago, with headquarters in that city. Mr. Macomb was born on January 24, 1877, at Branchport, N. Y., and was educated at the University of Kansas, where he graduated in 1898. He entered railway service on August 1, 1899, in the engineering department of the Santa Fe, and served as rodman and instrumentman on surveys in eastern Oklahoma and southeastern Texas until January, 1901, when he was promoted to resident engineer and bridge engineer on construction in southeastern Texas, eastern Oklahoma and New Mexico. In June, 1907, he entered the office of the bridge engineer of the system at Chicago, where he remained until May, 1908, when he become an assistant engineer in the office of the chief engineer of the system at Chicago. He travelled in Europe from May, 1910, to June, 1911, and represented the Santa Fe at the International Railway Congress held in Switzerland in May, 1910. From June, 1911, to May, 1912, he was assistant engineer in the office of the chief engineer of the system at Topeka, Kan., and was promoted on the latter date to office engineer in charge of rail specifications, requirements and investigations, the office being moved to Chicago in 1913. Mr. Macomb was on active duty during the World War from September, 1917, to January, 1919, as captain and major of engineers. From February to July, 1918, he was in charge of track construction at Gievres, France. In September of the same year he organized the 548th Engineers and during December was in command of a portion of the 20th Engineers. He was elected a director of the American Railway Engineering Association at its convention last March.

J. de N. Macomb

Trade Publications

The Chipman Chemical Engineering Company, Bound Brook, N. J., has established a factory at Winnipeg, Manitoba to enable it to serve the Canadian railways better and particularly to aid in the execution of a contract for the treatment of approximately 2,700 miles of the Western lines of the Canadian Pacific with Atlas "A" and Atlas "N P" weed killer. This company has also opened a Canadian office in the Trust and Loan Building, Winnipeg, with J. D. Ruttan in charge.

A Tale of Yesterday, Today and Tomorrow.—The Joseph Dixon Crucible Company, Jersey City, N. J., has issued an attractively printed booklet on the occasion of the one hundredth anniversary of the founding of its business, wherein is given a history of its progress since it was established at Salem, Mass., in 1827, by Joseph Dixon. Its first activity was the manufacture of graphite crucibles and from this beginning it has expanded to embrace the preparation of graphite for multifarious other uses.

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Federal Cement Tile Co.
Massey Concrete Prod. Corp.
R. C. Products Co., Inc.

Building Material
Johns-Manville Corp.

Building Papers
Lehon Co.

Bumping Posts
Buda Company
Louisville Frog & Switch Co., Inc.
Mechanical Mfg. Co.

Calcium Carbide
Oxweld Railroad Service Co.

Car and Locomotive Replacers
Edelblute Co., T. H.

Car Replacers
Edelblute Co., T. H.

Cars, Ballast
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Cars, Dump
See Dump Cars

Cars, Hand
Buda Co.
Fairbanks, Morse & Co.
Fairmont Ry. Motors, Inc.
Kalamazoo Ry. Supply Co.
Mudge & Co.
Northwestern Motor Co.

Cars, Industrial
Clark Car Co.
Koppel Industrial Car & Equipment Co.
Magor Car Corp.
Western Wheeled Scraper Co.

Cars, Inspection
Buda Co.
Euclid Electric & Mfg. Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Cars, Motor
Buda Co.
Euclid Elecric & Mfg. Co.
Fairbanks, Morse & Co.
Fairmont Ry. Motors, Inc.
Kalamazoo Ry. Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Cars, Section
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Car, Spreader
Clark Car Co.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Car Stop, Friction
Maintenance Equipment Co.

Cars, Velocipede
Buda Company
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.

Castings
Bethlehem Steel Co.
Louisville Frog & Switch Co., Inc.
Wharton, Jr. & Co., Inc., Wm.

Cattle Guards
Fairbanks, Morse & Co.
Kalamazoo Railway Supply Co.

Cattle Passes
Massey Concrete Products Corp.

Cement, High Temperature
Johns-Manville Corp.

Cement Repair
Barber Asphalt Co.
Carey Co., Philip

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Coal Handling Machinery
Hayward Co.

Coaling Stations
Fairbanks, Morse & Co.

Compressors
Ingersoll-Rand Co.
Sullivan Machinery Co.

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Concrete Units, Miscellaneous
Federal Cement Tile Co.
Massey Concrete Prod. Corp.
R. C. Products Co., Inc.

Condensers
Ingersoll-Rand Co.

Corrugated Iron
Armco Culvert & Flume Mfrs. Ass'n.

Counterweight Drums
Hayward Co.

Cranes, Barge, Electric Erecting, Gantry, Locomotive, Pillar, Transfer, Tunnel, Wharf and Wrecking
Brown Hoisting Machinery Co.
Interstate Car & Foundry Co.

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Cribbing, Concrete
Federal Cement Tile Co.
Massey Concrete Products Corp.
R. C. Products Co., Inc.

Crossing Gates
Buda Co.
Kalamazoo Railway Supply Co.

Crossings, Highway
Barber Asphalt Co.
Carey Co., Philip
Headley Good Roads Co.
Kentucky Rock Asphalt Co.
Ohio Valley Rock Asphalt Co.

Crossings, Rail
Bethlehem Steel Co.
Buda Co.
Interstate Car & Foundry Co.
Louisville Frog & Switch Co., Inc.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Crushers, Stone
Western Wheeled Scraper Co.

Culvert Pipe
American Casting Co.
American Cast Iron Pipe Co.
Armco Culvert & Flume Mfrs. Ass'n.
Central Alloy Steel Corp.
Massey Concrete Products Corp.

Curbing
Massey Concrete Products Corp.

Derails
Q & C Co.
Track Specialties Co.
Wharton Jr. & Co., Wm.

Derrick Cars
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Diesel Engines
Fairbanks, Morse & Co.
Ingersoll-Rand Co.

Diesel Electric Power Plants
Fairbanks, Morse & Co.
Ingersoll-Rand Co.

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Fairmont Railway Motors, Inc.

Disinfectants
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Ditchers
Jordan Co., O. F.

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Ingersoll-Rand Co.
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Drill Steel, Rock
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Sullivan Machinery Co.

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Buda Co.
Ingersoll-Rand Co.
Kalamazoo Railway Supply Co.
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Differential Steel Car Co.
Koppel Industrial Car & Equipment Co.
Jordan Co., O. F.
Western Wheeled Scraper Co.

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Euclid Electric Co.
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Northwestern Motor Co.
Syntron Co.

Electric Snow Melters
Q & C Co.

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Buda Co.
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Ingersoll-Rand Co.
Kalamazoo Railway Supply Co.
Mudge & Co.
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Woolery Machine Co.

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Buda Co.
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Fairbanks, Morse & Co.
Fairmont Railway Motor Co.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Engines, Oil
Buda Co.
Fairbanks, Morse & Co.
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Page Fence Association
Q & C Co.

Fence, Fabric
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Cyclone Fence Co.
Page Fence Association

Fence Posts
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Page Fence Association
Q & C Co.

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Q & C Co.

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Q & C Co.

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Q & C Co.

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Fairbanks, Morse & Co.

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Lehon Co.

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Rail Joint Co.
Track Specialties Co.

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Jacks, Smoke
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Hackmann Railway Supply Co.
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Reliance Manufacturing Co.
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Woodings Forge & Tool Co.

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Preservation, Timber
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Pumps, Air Pressure & Vacuum, Centrifugal, Deep Well, Piston, Plunger, Rotary, Slump
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Sullivan Machinery Co.

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P. & M. Co.
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Verona Tool Works

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Q & C Co.
Track Specialties Co.
Verona Tool Works

Rail Bonds
Verona Tool Works

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Buda Co.
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Maintenance Equipment Co.
Parsons Co.

Rail Saws, Portable
Kalamazoo Railway Supply Co.
Q & C Co.

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Rails, Girder
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Rails, Tee
Bethlehem Steel Co.
Carnegie Steel Co.

Regulators, Oxy-Acetylene
Oxweld Railroad Service Co.

Removers, Paint and Varnish
Mudge & Co.

Replacers, Car
Buda Co.
Edelblute Co., T. H.
Q & C Co.

Replacers, Car & Locomotive
Edelblute Co., T. H.

Replacing Frogs
Edelblute Co., T. H.

Rerailers
Edelblute Co., T. H.

Retaining Walls, Precast
Federal Cement Tile Co.
Massey Concrete Product Corp.
R. C. Products Co., Inc.

Rivets
Bethlehem Steel Co.
Louisville Frog & Switch Co., Inc.

Rock Hammers
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Rods, Welding
Oxweld Railroad Service Co.

Roof Slabs
Federal Cement Tile Co.
Massey Concrete Products Corp.

Roofing, Asbestos
Johns-Manville Corp.

Roofing Composition
Barber Asphalt Co.
Lehon Co.

Roofing, Corrugated
Johns-Manville Corp.

Rules
Lufkin Rule Co.

Saw Mills
American Saw Mill Machy. Co.

Saws, High Speed Friction
American Saw Mill Machy. Co.

Saw Rigs
American Saw Mill Machy. Co.
Fairbanks, Morse & Co.

Scales, Tape
Lufkin Rule Co.

Scales, Track
Fairbanks, Morse & Co.

Scoops
Ames Shovel & Tool Co.

Scrapers, Wheel, Drag & Buck
Western Wheeled Scraper Co.

Screw Spikes
Illinois Steel Company
Malleable Screw Products, Inc.

Screw Spike Drivers
Ingersoll-Rand Co.

Section Cars
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Sharpeners, Rock Drill Steel
Ingersoll-Rand Co.

Sheathing Paper
Barber Asphalt Co.
Lehon Co.

Sheet Iron
Armco Culvert & Flume Mfrs. Ass'n.

Sheets, Corrugated
Johns-Manville Corp.

Shingles, Composition
Barber Asphalt Co.
Lehon Co.

Shovels
Ames Shovel & Tool Co.
Interstate Car & Foundry Co.
Verona Tool Works
Woodings Forge & Tool Co.

Siding, Corrugated and Plain
Johns-Manville Corp.

Signal Foundations, Concrete
Massey Concrete Products Corp.

Signals, Bridge Warnings
Hastings Signal & Equip. Co.

Skid Excavators & Dredges
Hayward Co.

Skid Shoes
Q & C Co.

Slabs, Concrete
Massey Concrete Products Corp.

Smoke Stacks
Massey Concrete Products Corp.

Snow Melting Devices
Q & C Co.

Snow Plows
Jordan Co., O. F.
Q & C Co.

Spades
Ames Shovel & Tool Co.

Spike Pullers
Louisville Frog & Switch Co., Inc.

Spikes
Bethlehem Steel Co
Illinois Steel Company

Spreader Cars
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Standpipes (Penstock)
Fairbanks, Morse & Co.

Stands, Switch & Target
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Q & C Co.
Ramapo Ajax Corp.

Steel, Alloy
Central Alloy Steel Corp.
Illinois Steel Company

Steel Cross Ties
Carnegie Steel Co.

Steel Plates and Shapes
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company

Step Joints
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Storage Tanks
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Structural Steel
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company

Switches
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Buda Company
Interstate Car & Foundry Co.
Louisville Frog & Switch Co., Inc.
Ramapo Ajax Corp.
Track Specialties Co.
Wharton Jr. & Co., Wm.

Switchmen's Houses
Massey Concrete Products Corp.

Switchpoint Protector
Maintenance Equipment Co.

Switchstands & Fixtures
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

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Tank Fixtures
Fairbanks, Morse & Co.

Tanks, Steel
Pittsburgh Des Moines Co.

Tape, Insulating
Johns-Manville Corp.

Tapes, Measuring
Lufkin Rule Co.

Tee Rails
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Telephone Service, Long Distance
American Telephone & Telegraph Co.

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Telegraph Service, Long Distance
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Telltales
Hastings Signal & Equipment Co.

Testing of Materials
Hunt Co., Robert W.

Thawing Outfits
Q & C Co.

Thermit Welding
Metal & Thermit Corp.

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International Creosoting & Construction Co.

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Bethlehem Steel Co.
Illinois Steel Co.
Lundie Engineering Corp.
Sellers Manufacturing Co.
Track Specialties Co.

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Q & C Co.

Tie Rods
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Tie Spacers
Maintenance Equipment Co.

Tie Tampers
Electric Tamper & Equipment Co.
Ingersoll-Rand Co.
Syntron Co.

Timber, Bridge
Interstate Car & Foundry Co.

Timber, Creosoted
International Creosoting & Construction Co.
Prettyman & Sons, J. F.

Timber, Slab
Interstate Car & Foundry Co.

Tile, Roofing
Federal Cement Tile Co.

Tools, Drainage
Ames Shovel & Tool Co.

Tools, Oxy-Acetylene Cutting & Welding
Oxweld Railroad Service Co.

Tools, Pneumatic
Ingersoll-Rand Co.

Tools, Track
Ames Shovel & Tool Co.
Buda Co.
Hackman Railway Supply Co.
Maintenance Equip. Co.
Q & C Co.
Verona Tool Works
Woodings Forge & Tool Co.

Tongue Switches
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. Co., Wm.

Torches, Oxy-Acetylene Cutting & Welding
Oxweld Railroad Service Co.

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Buda Co.
Kalamazoo Railway Supply Co.
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Treating Plants, Water
American Water Softener Co.

Trestle Slabs
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Tunnel Warnings
Hastings Signal & Equipment Co.

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Johns-Manville Corp.
Q & C Company

Warning Devices, Bridge & Tunnel
Hastings Signal & Equipment Co.

Water Columns
Fairbanks, Morse Co.

Water Cranes
Fairbanks, Morse Co.

Water Fountains, Drinking
Halsey Taylor Co.

Water Softening Plants
American Water Softening Co.

Water Tanks
Pittsburgh Des Moines Co.

Water Treating Plants
American Water Softening Co.

Waterproofing Fabrics
Barber Asphalt Co.
Johns-Manville Corp.
Lehon Co.

Weed Burner
Woolery Machine Co.

Weed Killer
Chipman Chemical Engineering Co., Inc.
Q & C Co.

Welding & Cutting Equipment
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Welding, Oxy-Acetylene
Oxweld Railroad Service Co.

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Wheels, Hand & Motor Car
Buda Co.
Fairbanks, Morse & Co.
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Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

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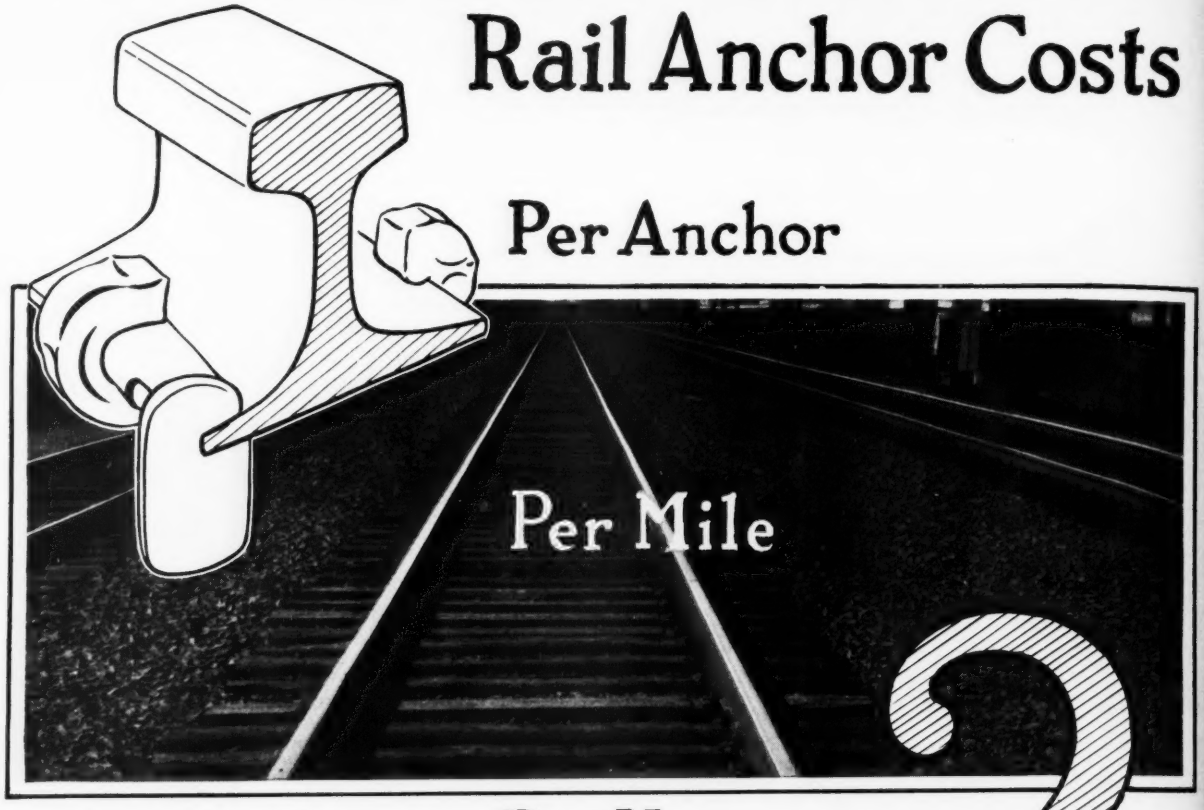

Per Haps

Per Anchor—Obviously it is impossible to judge the cost of arresting rail creepage by the price of the individual rail anchor. This is not a defence of the price of the Ericson Rail Anchor, for like all Verona products it is priced at cost plus a reasonable profit.

Per Mile—On the other hand, it is perfectly logical to judge the cost of arresting rail creepage on the "per mile" basis. That is to say, the product of the cost of the individual rail anchor by the number of anchors per mile. We believe that the Ericson Rail Anchor is the cheapest anchor per mile of track. A single anchor will hold a rail to the limit of the tenacity of the ballast. An Ericson Anchor may carry the bearing tie through the ballast, but it will not lose its initial position on the rail. For this reason, you can probably stop your rails from creeping with fewer Ericson Anchors than with any other device.

Per Haps—Of course the most expensive practice in the world is to pay for something that you do not get. When you buy rail anchors, you are paying not for so many pieces of iron or steel, but for the service of stopping the rails from creeping. There can be no doubt about that. If your anchors are right, the rails won't creep. It is worth while occasionally to walk track and see just what your rail anchors are doing.

VERONA TOOL WORKS - - PITTSBURGH